

IoT-BASED SMART MANAGEMENT OF BIRD FARM

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Technology degree in
Information Technology

By

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DEPARTMENT OF INFORMATION TECHNOLOGY
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SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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BONA FIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **MARY NANCY R (Reg No.39120069)** and **GOBIGA B (Reg No. 39120032)** who carried out the Project Phase-2 entitled "**IoT-BASED SMART MANAGEMENT OF BIRD FARM**" under my supervision from January 2023 to May 2023.

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I, **MARY NANCY R(Reg No. 39120069)**, hereby declare that the Project Phase-2 Report entitled “**IoT-BASED SMART MANAGEMENT OF BIRD FARM**” done by me under the guidance of **Dr. J. JABEZ, M.E., Ph.D.** is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Information Technology

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ABSTRACT

Birds enrich our lives with color, song, and joy. It calms down stressed individuals of all ages. Farmers now have the profitable business option of raising birds. In India, there are thought to be 30 million farmers that raise birds. In Tamil Nadu, there are about 300,000 farms. There are about 2000 different species of birds. A few factors that affect bird farms include climate change, habitat degradation, and declining food supply. This farm also has difficulties with incorrect feeding, bird health, and security issues including theft. A lot of daily regular work is required to maintain a bird farm, including routine bird watching, health monitoring, feeding, local hygiene, and other duties. The actual procedure of doing all of this is increasingly complicated. Consequently, to obtain the proprietors of the farm Intelligent Automated Bird Farm Management System with IoT is proposed. Birds get sick from unhygienic maintenance, which can be lethal. Massive losses can occur if an illness in one bird spreads to the entire farm. Losses are also due to farm fires and can also be brought on by the farm being infected with hazardous gases. Water is the main source of avian disease. These criteria could cause this business to suffer a substantial loss. Therefore, it is essential to preserve and safeguard them. To get around this, the farm might be automated based on variables like the environment's temperature and humidity, water level, and water quality.

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CHAPTER 1

INTRODUCTION

Climate change, habitat degradation, and dwindling food supplies are several threatening parameters for bird farms. Other challenges faced by this farm include improper feeding, bird health, and safety measures such as theft. Maintaining a bird farm requires a lot of daily routine work such as routine bird watching, health monitoring, feeding, local hygiene, and so on. Unsanitary maintenance causes illness in birds, which can be fatal. A disease in one bird can spread to the entire farm, resulting in massive losses. These parameters may result in a significant loss in this business. As a result, it is critical to conserve and protect them. To overcome this, the farm could be automated based on certain parameters such as water level and water purity. Environmental variables such as air temperature and humidity must be monitored and their effects studied in the long run to gain knowledge. Because the bird farm is spread out over such a large area, a lot of electricity and laborers are required to keep it running. The cost of electricity, and maintaining them is also prohibitively expensive. Sometimes the carelessness of the workers on these farms wastes energy and other resources, resulting in financial loss. An automated bird farm solves this problem by preventing from losing resources. The other difficult concerns about safety and security include bird theft, farm fires, and keeping safe from other domestic animals such as cats. Another major concern is the health and hygiene of the farm's animals. Clean water and sanitation are critical for the well-being of birds because impurities and contaminated water can genetically manipulate the sick and spread those illnesses to other birds, potentially resulting in a significant loss of birds. The quality of water must be improved in order to provide clean water to birds. To address this, the farm could be automated based on parameters such as water level and purity. There are also issues such as varying climate actions that have an impact on the health of the birds; some birds cannot tolerate cold climates, resulting in their death. Bird health is significantly impacted by temperature and humidity. For farm owners, the loss of birds could mean a huge financial loss. All of these difficulties must be made clear in order to run a large bird farm.

CHAPTER 2

LITERATURE SURVEY

A. IOT-BASED SMART AUTOMATED POULTRY FARM MANAGEMENT SYSTEM – 2022

Author: Bharati Ramteke, Snehlata Dongre

Internet of Things-based intelligent automated system for managing poultry. To feed and hydrate birds, the approach makes use of internal sensors. When dihydrogen monoxide levels are low, the alert sounds. A sensor on the chicken farm regulates the lighting. A pure dihydrogen monoxide supply, automatic meal delivery, and egg storage are all possible with this technology. As a result of poor management and care of poultry farms, the authors of this study proposed a method for producing salted birds and lowering the death rate of hens. They believe that efficient management and productivity are identical to ongoing supervision. In order to enable the system to autonomously interact with sensors, it makes use of IoT components in its implementation. The user gets the alert notification in the form of a text message. The web interface is made to monitor all outcomes.

B. IOT-BASED SMART MANAGEMENT OF POULTRY FARM AND ELECTRICITY GENERATION - 2018

Author: Kadam Anaji Sitaram, KinjawadEkar Rasika Ankush, Kadam Nikhil Anant, Bane Raman Raghunath

The goal of this article is to automate management tasks on a chicken farm using IoT technologies. Manual tasks like food feeding, water supply, and sanitation are managed, as are environmental factors that have an impact on chicken health. Additionally, methane gas created from chicken dung and stored in batteries is used to generate electricity. A webbased system that maintains track of the management of poultry farms from anywhere and at any time can also be used for farm management and monitoring. The Arduino Uno is connected to all of the sensor modules, and after the sensor readings are collected, the GPRS module is used to

upload the data to the website. As a result, the owner or manager of the farm may examine the farm's internal environment online using a computer or mobile device.

C. IOT-BASED SYNERGISTIC APPROACH FOR POULTRY MANAGEMENT SYSTEM - 2021

Author: Moses Oluwafemi onibonoje

IoT is a new technology that connects sensors, personal computers, and other devices to communication infrastructure and the internet using software to enable autonomous activities free from human interference. IoT is ready to have a significant impact on the agri-food industry and develop into a key component of a modern chicken farm. When IoT is used in smart poultry production, internet-based gadgets will act autonomously and people will only step in when doing so requires a higher level of intelligence. The use of radiofrequency tags in poultry systems is also highly beneficial for tracking the frequency of feeding, the frequency of egg production, and the health of the birds.

D. IoT-BASED POULTRY HOUSE MONITORING SYSTEM - 2019

Author: V.V. SANTHOSH KUMAR¹, S. SEENUVASAN, S. SHAJITH BAIG, T. VIMALESH, M. SHANTHI

The approach shows how innovative technologies can be designed to give control and monitoring over vast areas and over extended periods of time. To make sure everything is running smoothly, the temperature and humidity conditions in a chicken house should be checked periodically. Security is increased by using an RFID reader and tag. The internal temperature of the chicken was measured using a temperature sensor.

E. IOT BASED POULTRY HOUSE MONITORING - 2019

Author: Noridayu Manshor, Amir Rizaan Abdul Rahiman

Lately, incalculable Internet resources have been added to the utilization of IoT (Internet of Things)-based systems. The system serves as an example of how creative systems can be developed to provide control and monitoring over large

areas and over long periods of time. Temperature and humidity levels in a chicken house should be checked frequently to make sure everything is working properly.

F. IOT BASED SMART POULTRY FARM - 2019

Author: Ayyappan. V, Deepika. T, Divya Dharshini. S, Elayaraja. M, Shanmugasundaram. R

The primary goal of this technology is to automate poultry farms using WSN and mobile communication systems. The environmental factors of a poultry farm are routinely tracked and managed in this study to promote chicken growth, including temperature, humidity, and ammonia gas. With the aid of the sensor module, the water level may also be managed and watched. All sensor readings are collected by the microcontroller, and using a wifi module, the readings are updated on the website. It will turn on the gadgets based on the minimum and maximum values.

G. REMOTE MONITORING AND CONTROL OF POULTRY FARMS USING IOT TECHNIQUES - 2018

Author: Eric Hitimana, Gaurav Bajpai, Richard Musabe, Louis Sibomana

This study focuses on automating the chicken farming sector so that the amount of physical labor can be decreased. Regular monitoring of climate change results in prompt management of those changes. In addition to ensuring that the chickens receive regular water supplies, water management mechanisms assist prevent water wastage. The suggested approach will improve productivity, lessen environmental diseases that impact chickens, and get rid of a lot of workers who might make mistakes. The data analysis can also be considered by the approach.

H. SMART POULTRY FARM INCORPORATING GSM AND IOT - 2020

Author: Md. Mahfujul Islam, Shaharya Sourov Tonmoy, Sazzad Quayum, Al Russel Sarker, Sumaiya Umme Hani, Mohammad Abdul Mannan

Modern chicken farms can liberate farmers from time-consuming and outmoded traditional tiresome practices. A smart poultry farm has numerous distinguishing characteristics at this early level, including automation in the delivery of water and

food, collecting eggs, maintaining accurate environment parameters, etc. Security precautions have been implemented, including fire protection and antithief features that guarantee a comprehensive watch over the farm. Automation has several advantages, including reduced labor expenses, lower maintenance costs, lower overall material prices, and an increase in a particular product's quality, accuracy, and precision.

I. IOT-BASED SMART WEATHER MONITORING SYSTEM FOR POULTRY FARM-2020

Author: Jenny Priyanka mondol, Khan Raqib Mahmud, Muhammad golam kibria

The aforementioned authors created an IoT-based weather monitoring system for a poultry farm, which has been proposed in this system, to improve management and raise the efficiency of the farm. This system keeps track of the weather, food quality, the health of the chickens, and when to feed them. The proposed system's temperature and humidity are measured using DHT11. The information gathered is sent to a cloud-based server, kept in a database, and constantly examined against minimum levels.

J. DEVELOPMENT OF SMART CHICKEN POULTRY FARM USING RTOS ON ARDUINO-2019

Author: Teddy Surya Gunawan, Mohamad Firdaus Sabar, Haidawati Nasir, Mira kartiwi, S.M.A.Motakabber

IoT for precision agriculture can be used to create an active monitoring system that maintains the ideal environmental conditions, including temperature, CO₂, ammonia, and humidity. Following the use of a range of sensors to track the ammonia and CO₂ levels, dc fans are going to be employed to keep them to the optimal level. Additionally recorded and regulated by a DC fan and heat lamp will be the humidity and temperature.

2.1. INFERENCES FROM LITERATURE SURVEY

We can infer from the literature review that many projects have focused on maintaining poultry farms using technology to keep them organized and clean. Some of the projects focused on features such as electricity generation, fire indication, etc. in addition to automated farming. Using sensors placed inside containers also entails feeding and watering birds. When the stock element and dihydrogen monoxide are low, the system will sound an alarm. A sensor in the poultry farm controls the lighting. This system can be used for automatic food distribution, pure dihydrogen monoxide supply, and egg accumulation. The suggested system transforms traditional farms into smart farms. It gives the owner of a flock of chickens faster and more precise information about various parameters. the clever monitoring of various parameters using a wireless sensor network, such as temperature, light, humidity, gas, etc. Not only for chicken owners but also for anyone considering poultry farming as a side business, the System is more affordable and less expensive.

2.2. OPEN PROBLEMS IN THE EXISTING SYSTEM

The previous system was primarily concerned with maintaining poultry birds. It mainly concentrated on boosting the production of poultry farms and making money. It focused on maintaining poultry birds by keeping an eye on the temperature, humidity, and ammonia gas released. Additionally, it concentrated solely on the growth of chicks. The current project can only be implemented for chickens; other birds cannot. In order to maintain other private bird farms, we automate the area where the birds reside, including some features like checking the quality of the water and constructing a low-cost nest box for them.

CHAPTER 3

REQUIREMENT ANALYSIS

3.1. FEASIBILITY STUDIES/RISK ANALYSIS OF THE PROJECT

This system involves using sensors, cameras, and other devices to monitor and manage various aspects of the farm such as temperature, humidity, lighting, feed and water consumption, and bird health.

A feasibility study of the project should assess whether it is technically possible and economically viable. The study should consider the cost of the sensors and devices, installation and maintenance costs, and potential cost savings from improved efficiency and reduced labor costs. It should also evaluate the potential benefits of the system, such as improved productivity, increased yields, and better-quality products.

A risk analysis should be conducted to identify potential risks and develop strategies to mitigate them. Risks may include equipment failure, cyber attacks, data breaches, and system malfunctions. The analysis should consider the likelihood and potential impact of each risk, as well as the cost of implementing safeguards or contingency plans.

Additionally, it is important to consider the ethical implications of using IoT technology in the management of bird farms, particularly in relation to animal welfare. It is crucial to ensure that the monitoring and management of the birds do not cause unnecessary stress or harm to the animals.

Overall, a feasibility study and risk analysis of an IoT-based smart management of a bird farm project can help determine whether the project is viable and identify potential challenges and opportunities for improvement.

3.2. SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

The automated farm hardware system includes an Arduino Nano microcontroller, a light sensor, Ultrasonic sensor, temperature and humidity sensor, a gas sensor, a DC motor, an esp8266, a night sensor, fire sensor, a DC fan, a relay module, GSM module.

Software requirements include:

- Arduino IDE

3.3. SYSTEM USE CASE

Here are some potential system use cases for an IoT-based smart management system for a bird farm:

- *Monitoring bird health:* The IoT sensors can be used to monitor the health of the birds in real time by collecting data on their food and water intake, temperature, and activity levels. This information can be used to detect early signs of disease or distress, allowing for timely intervention.
- *Tracking environmental conditions:* IoT sensors can track environmental conditions such as temperature, humidity, and air quality to ensure that the birds are living in optimal conditions.
- *Controlling feeding and watering:* IoT sensors can be used to control the amount of food and water provided to the birds, ensuring that they are receiving the correct amounts and reducing waste.
- *Monitoring energy consumption:* IoT sensors can track energy consumption and identify areas for optimization, potentially reducing energy costs for the farm.
- *Preventing theft or intrusion:* IoT sensors can be used to detect any unauthorized access to the farm, such as a break-in, and alert the appropriate personnel.
- *Analyzing data for insights:* The system can collect and analyze data from various sensors to identify patterns and trends, providing insights for better decision-making and farm management.
- *Automating tasks:* The system can automate tasks such as opening and closing doors, adjusting temperature, and turning lights on and off, reducing the need for manual labor.

Overall, an IoT-based smart management system for a bird farm can provide valuable insights, increase efficiency, and improve the health and well-being of the birds, ultimately leading to a more profitable and sustainable farm operation.

CHAPTER 4

DESCRIPTION OF PROPOSED SYSTEM

4.1. SELECTED METHODOLOGY/PROCESS MODEL

A. HARDWARE DESIGN

The block diagram of the suggested system, which includes a number of remote sensors and microcontrollers, is shown in Fig. 4.1. Due to its small size, compatibility with current and voltage requirements, and grove pins, the Arduino Nano was chosen as the microcontroller unit. Data is gathered by Arduino Uno from several sensors installed in a bird farm. The GSM module is used by a variety of sensors to connect to the mobile phone, including temperature and humidity sensors, water level sensors, IR sensors, light sensors, water quality sensors, and others. The proposed approach included several sensors, each of which performs a particular function. Environment and water quality make up the bulk of the system on which we concentrate. To monitor the environment, a DHT11 temperature and humidity sensor is deployed. This sensor is used to identify high temperatures and high levels of humidity. This system has been set up so that it will turn on the heater and fan in accordance with the pre-programmed function when the temperature and humidity are high or low. The Arduino is equipped with feed availability sensing, which checks the supply of food for birds. It is checked by mounting the ultrasonic sensor on top of the food container; as a result, when there is insufficient food, the automatic food pump fills the container; once it is full, it shuts off. Water level sensing is used, much like the approach discussed earlier, to determine how much water is present inside the container. Water pumps fill it up with water when it runs low. The water quality sensor, which monitors the quality of water kept for the birds, is the other major sensor linked. It examines a number of things, including pH, conductivity, and several other elements involved. If it is discovered to be impure, the owner is notified and is forced to replace the water and maintain excellent quality in order to safeguard the health of the birds. The birds' cage has vibration sensing for theft warning systems installed at the doors to assist in identifying theft attempts.

The alarm system is configured to sound whenever a theft attempt is made, alerting the employers to the situation. This aids in the correct upkeep of the bird farm and the prevention of bird losses. Likewise, the fire sensor and MQ2 gas sensor helps in detecting fires and harmful gases released inside the farm and make necessary actions to prevent them. In order to reach the access node, the processed data from the Arduino is transmitted over a transceiver. The data is transmitted by the access node to the internet, where it is immediately accessible. The necessary stakeholders and the manager of the bird farm are informed in real-time when access nodes, as well as the cloud, take an action in response to data out from sensor devices. For mobile connectivity, a GSM module is used.

B. SOFTWARE DESIGN

The proposed system is built and put into action based on a few key factors that have a significant impact on birds' health, while also offering the required controls and upkeep. Fig. 4.2. shows the proposed system's flow diagram.

The temperature and humidity sensor, DHT11, provides information. The recorded data is compared to the ideal temperature needed for the bird to survive, and if there is a decrease in temperature or a rise in temperature, the appropriate steps are taken. If the temperature is high, a fan is engaged until it returns to normal; if it is low, a heater is activated. Likewise, a fan is turned on if the humidity is high and water vapor is blown if it is low. Thus, the farm is able to maintain its ideal temperature and humidity. The container's water quality is checked using a water quality sensor. If the water is unsafe to drink, the owner is informed and instructed to change the water.

Therefore, the two major facts mentioned above can be used to treat the health issues affecting birds and to maintain a healthy environment, which will aid in the development of birds. Additionally, the lighting system is set up to save electricity waste and automate the farm, which reduces labor requirements.

The fire and gas sensing helps in the detection of fires and gases released, so if any fire is detected DC fan is turned ON and alerted to the owner through mobile. If the tank is discovered to be empty, the water and food pump system will assist in filling it with the assistance of a pump. The food feeder is checked to see if it is empty

using an IR sensor. Water level sensors are used to determine how much water is present in a container; if there is insufficient water, a water pump is engaged to fill the container. The cage's doors have an anti-theft mechanism installed as well. The alarm system is set off if there are any theft-related activities discovered, and the alarm notifies the owner and labor of this. Overall, the farm is fully automated.

4.2. ARCHITECTURE/OVERALL DESIGN OF PROPOSED SYSTEM

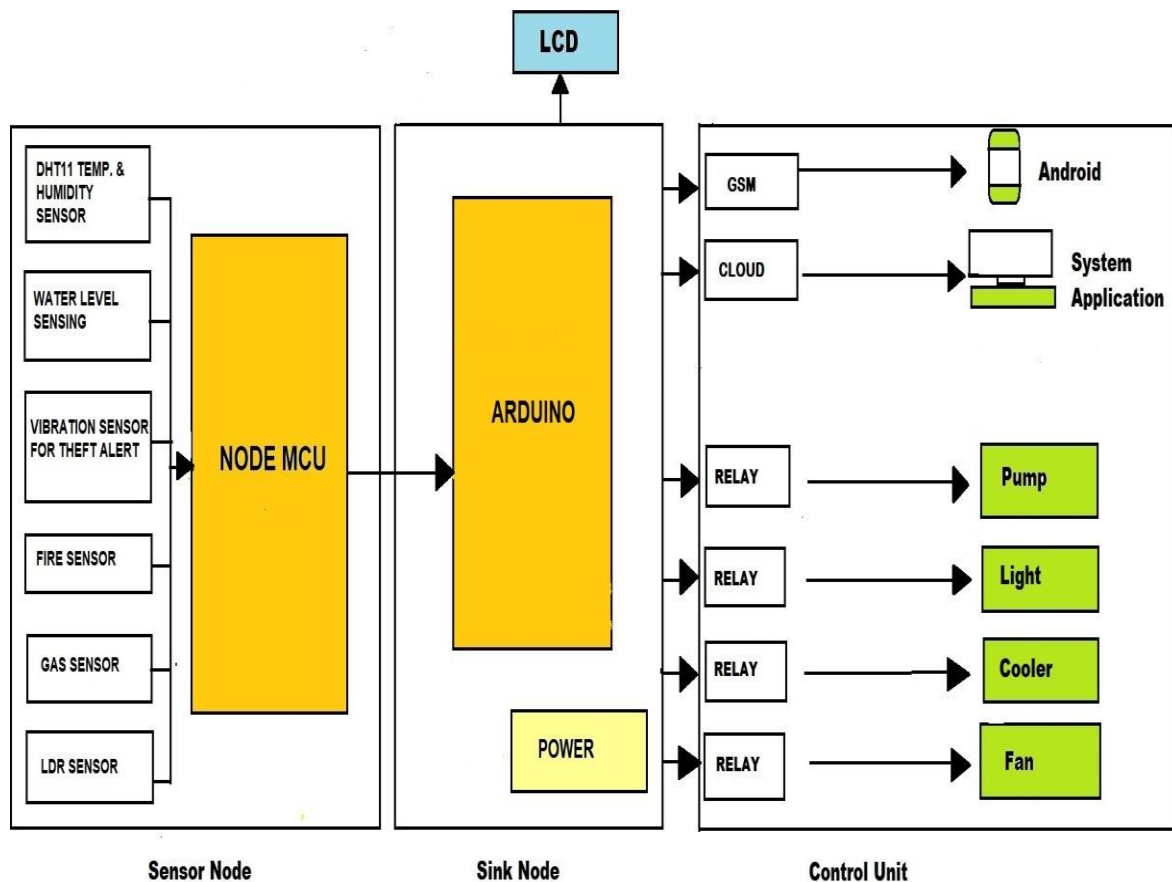


Fig.4.2.1. Block Diagram of the proposed system

4.3. DESCRIPTION OF HARDWARE & SOFTWARE FOR IMPLEMENTATION OF THE PROPOSED MODEL/SYSTEM

I. HARDWARE EXPLANATION

The Internet of Things (IoT), which enables data collection and sharing without human contact, connects common objects equipped with electronics, software, and sensors to the Internet. Everything in daily life that can be accessible or connected over the Internet is referred to as "Things" in the Internet of Things. For various IoT echo systems (architectures), the IoT operates differently. However, the fundamentals of how they operate are comparable.

Devices like smartphones, digital watches, and electronic appliances that securely connect with the IoT platform are the first step in the IoT's complete working process. Platforms gather and analyze data from numerous devices and platforms, then use apps to send the most useful data to devices. For various IoT echo systems (architectures), the IoT operates differently. However, the fundamentals of how they operate are comparable.

Internet of Things devices are non-standard gadgets that can wirelessly connect to a network and exchange data. The Internet of Things (IoT) is expanding internet connectivity beyond conventional devices like smartphones, laptops, tablets, and desktops. These gadgets' technological integration allows for remote monitoring and control as well as communication and interaction across networks.

A. ARDUINO NANO CONTROLLER

Arduino Nano is one type of microcontroller board, and it is designed by Arduino.cc. It can be built with a microcontroller like Atmega328. This microcontroller is also used in Arduino UNO. It is a small-size board and also flexible with a wide variety of applications. Other Arduino boards mainly include Arduino Mega, Arduino Pro Mini, Arduino UNO, Arduino YUN, Arduino Lilypad, Arduino Leonardo, and Arduino Due. And other development boards are AVR Development Board, PIC Development Board, Raspberry Pi, Intel Edison, MSP430 Launchpad, and ESP32 board.

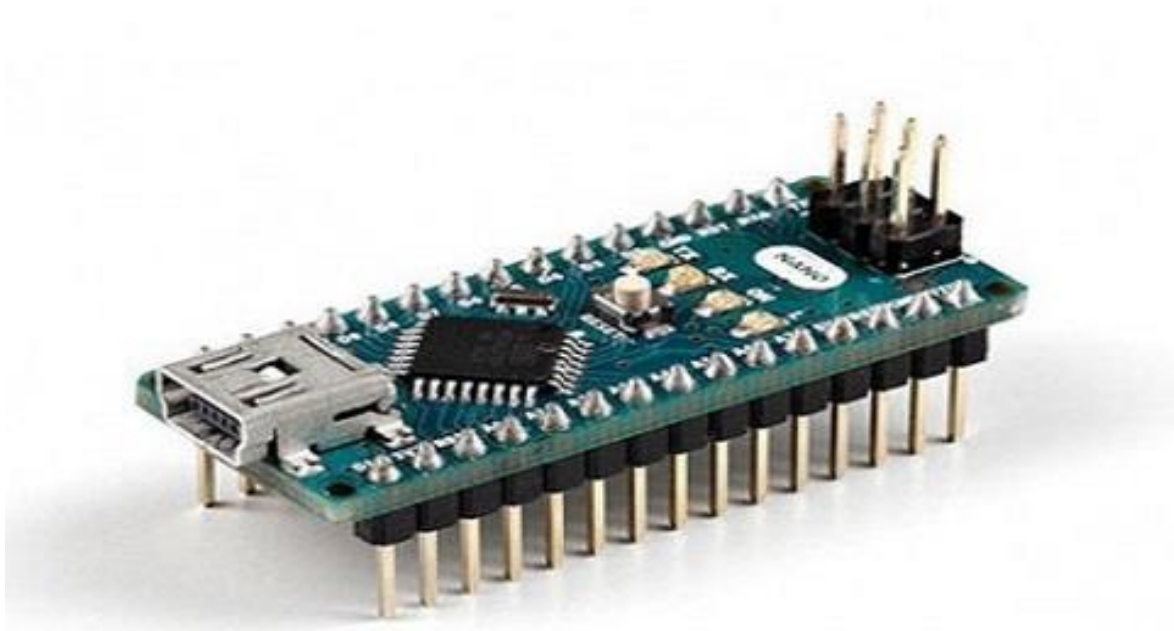


Fig.4.3.1. Arduino NANO Controller

the power supply can be given using a small USB port otherwise straightly connected to the pins like VCC & GND. This board can be supplied with 6 to 20volts using a mini USB port on the board. Fig.4.3.1. depicts the Arduino NANO controller. The communication of an Arduino Nano board can be done using different sources like using an additional Arduino board, or a computer, otherwise using microcontrollers. The microcontroller using in Nano board (ATmega328) offers serial communication (UART TTL). This can be accessible at digital pins like TX, and RX. The Arduino software comprises of a serial monitor to allow easy textual information to transmit and receive from the board. The TX & RX LEDs on the Nano board will blink whenever information is being sent out through the FTDI & USB link in the direction of the computer. The library-like Software Serial allows serial communication on any of the digital pins on the board. The microcontroller also supports SPI & I2C (TWI) communication.

These boards are used to build Arduino Nano projects by reading inputs of a sensor, a button, or a finger and gives an output by turning motor or LED ON, or and some of the applications are used in Samples of electronic systems & products, Automation, Several DIY projects, Control Systems, Embedded Systems, Robotics and Instrumentation.

B. NODEMCU MICROCONTROLLER

NodeMCU is an open-source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open-source projects, such as lua-cjson and SPIFFS. NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications. The NodeMCU microcontroller is depicted in Figure.4.3.2.



Fig.4.3.2. NodeMCU microcontroller

ESP8266 Arduino Core

As Arduino.cc began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate toolchains to allow Arduino C/C++ to be compiled for these new processors. They

did this with the introduction of the Board Manager and the SAM Core. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU's machine language. Some ESP8266 enthusiasts developed an Arduino core for the ESP8266 WiFi SoC, popularly called the "ESP8266 Core for the Arduino IDE".^[16] This has become a leading software development platform for the various ESP8266-based modules and development boards, including NodeMCUs.

C. DHT11 SENSOR

The DHT11 sensor can either be purchased as a sensor or as a module. Either way, the performance of the sensor is same. The sensor will come as a 4-pin package out of which only three pins will be used whereas the module will come with three pins as shown below in Fig.4.3.3.



Fig.4.3.3. DHT11 Sensor

The only difference between the sensor and module is that the module will have a filtering capacitor and pull-up resistor inbuilt, and for the sensor, you have to use them externally if required. The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature

and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of $\pm 1^\circ\text{C}$ and $\pm 1\%$. So if you are looking to measure in this range then this sensor might be the right choice for you.

D. MQ2 GAS SENSOR

The MQ2 sensor is one of the most widely used in the MQ sensor series. It is a MOS (Metal Oxide Semiconductor) sensor. Metal oxide sensors are also known as Chemiresistors because sensing is based on the change in resistance of the sensing material when exposed to gases. The MQ2 gas sensor operates on 5V DC and consumes approximately 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations ranging from 200 to 10000 ppm. Fig.4.3.4. depicts the gas sensor. The MQ2 is a heater-driven sensor. It is therefore covered with two layers of fine stainless steel mesh known as an “anti-explosion network”. It ensures that the heater element inside the sensor does not cause an explosion because we are sensing flammable gases.

It also protects the sensor and filters out suspended particles, allowing only gaseous elements to pass through the chamber. A copper-plated clamping ring secures the mesh to the rest of the body. Because the MQ2 is a heater-driven sensor, the calibration of the sensor may drift if it is left in storage for an extended period of time. When first used after a long period of storage (a month or more), the sensor must be fully warmed up for 24-48 hours to ensure maximum accuracy. If the sensor has recently been used, it will only take 5-10 minutes to fully warm up. During the warm-up period, the sensor typically reads high and gradually decreases until it stabilizes. Some of the MQ2 Gas Sensor Features & Specifications are:

- Operating Voltage is +5V
- Analog output voltage: 0V to 5V
- Digital Output Voltage: 0V or 5V (TTL Logic)
- Preheat duration 20 seconds
- Can be used as a Digital or analog sensor
- The Sensitivity of Digital pin can be varied using the potentiometer.



Fig.4.3.4. Gas sensor

E. VIBRATION SENSOR

The vibration sensor is also called a piezoelectric sensor. These sensors are flexible devices which are used for measuring various processes. This sensor uses the piezoelectric effects while measuring the changes within acceleration, pressure, temperature, force otherwise strain by changing to an electrical charge. This sensor is also used for deciding fragrances within the air by immediately measuring capacitance as well as quality. Fig.4.3.5. shows the vibration sensor. A vibration sensor, or vibration detector, measures vibration levels in machinery for screening and analysis. Maintenance teams use industrial vibration sensors for condition monitoring, giving them insight into the magnitude and frequency of vibration signals.



Fig.4.3.5. Vibration sensor

F. FIRE/FLAME SENSOR

A key aspect of fire protection is to identify a developing fire emergency in a timely manner, and to alert the building's occupants and fire emergency organizations. Fig.4.3.6. depicts the flame sensor. This is the role of fire detection and alarm systems. Depending on the anticipated fire scenario, building and use type, number and type of occupants, and criticality of contents and mission, these systems can provide several main functions. First they provide a means to identify a developing fire through either manual or automatic methods and second, they alert building occupants to a fire condition and the need to evacuate. Another common function is the transmission of an alarm notification signal to the fire department or other emergency response organization. They may also shut down electrical, air handling equipment or special process operations, and they may be used to initiate automatic suppression systems.

Flame sensor is the most sensitive to ordinary light that is why its reaction is generally used as flame alarm purposes. This module can detect flame or wavelength in 760 nm to 1100 nm range of light source. Small plate output interface

can and single-chip can be directly connected to the microcomputer IO port. The sensor and flame should keep a certain distance to avoid high temperature damage to the sensor. The shortest test distance is 80 cm, if the flame is bigger, test it with farther distance. The detection angle is 60 degrees so the flame spectrum is especially sensitive. The detection angle is 60 degrees so the flame spectrum is especially sensitive.

Specifications

- On-board LM393 voltage comparator chip and infrared sensing probe.
- Support 5V/3.3V voltage input.
- On-board signal output indication, output effective signal is high level, and the same time the indicator light up, output signal can directly connect with microcontroller IO.
- Signal detection sensitivity can be adjusted.
- Reserved a line voltage compare circuit (P3 is leaded out).
- PCB size: 30(mm) x15(mm).

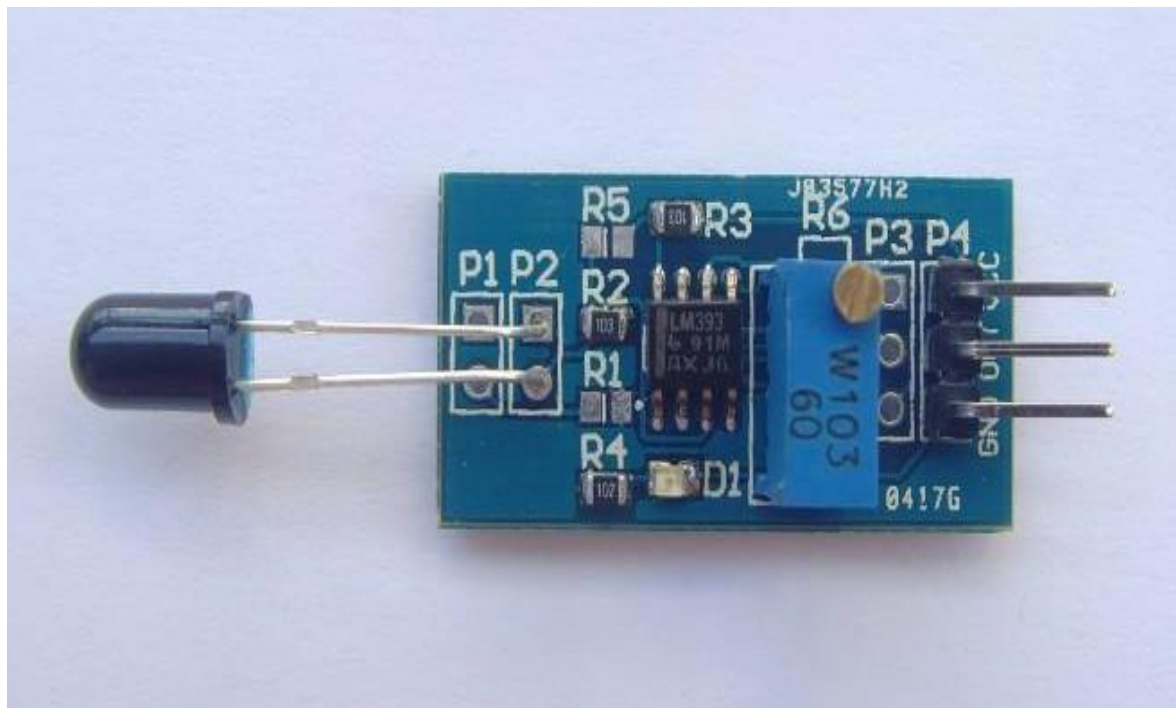


FIG.4.3.6. Flame sensor

G. LDR

A photo resistor or light-dependent resistor (LDR) or photocell is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits. A photo resistor is made of a high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as several meg ohm ($M\Omega$), while in the light, a photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photoresistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. Fig.4.3.7. and Fig.4.3.8. depicts the LDR sensor. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photoresistor can substantially differ among dissimilar devices. Moreover, unique photoresistors may react substantially differently to photons within certain wavelength bands.

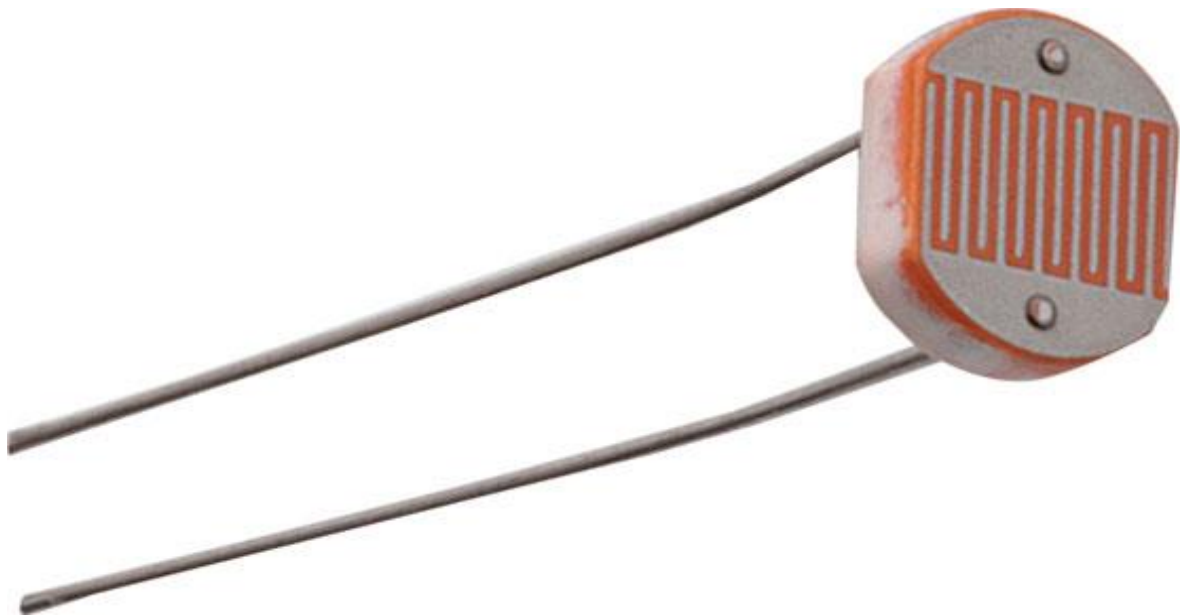


Fig.4.3.7. LDR sensor

The working principle of an LDR is photo conductivity that is nothing but an optical phenomenon. When the light is absorbed by the material then the conductivity of

the material reduces. When the light falls on the LDR, then the electrons in the valence band of the material are eager to the conduction band. But, the photons in the incident light must have energy superior than the band gap of the material to make the electrons jump from one band to another band (valance to conduction). Hence, when light having ample energy, more electrons are excited to the conduction band which grades in a large number of charge carriers. When the effect of this process and the flow of the current starts flowing more, the resistance of the device decreases.

Light-dependent resistors are simple and low-cost devices. These devices are used where there is a need to sense the presence and absence of light is necessary. These resistors are used as light sensors and the applications of LDR mainly include alarm clocks, street lights, light intensity meters, burglar alarm circuits. For a better understanding of this concept, here we have explained one project namely; power conserving of intensity controlled street lights using LDR.

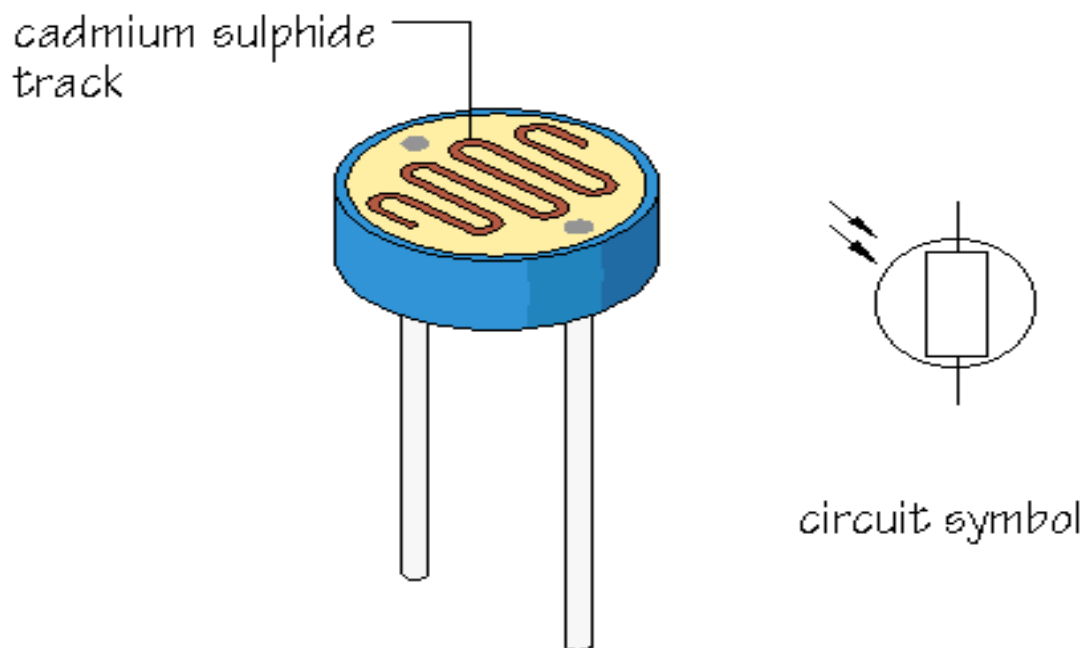


Fig.4.3.8. Circuit symbol of LDR

H. RELAY MODULE

A relay is an electro-magnetic switch which can be used in case of using a low voltage circuit to switch on and off a light bulb (or anything else) connected to the

220v mains supply, i.e., it is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have doubled left row (change over). Relays allow one circuit to switch a second circuit which is completely separated from the first. Fig.4.3.9. shows the Relay module.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

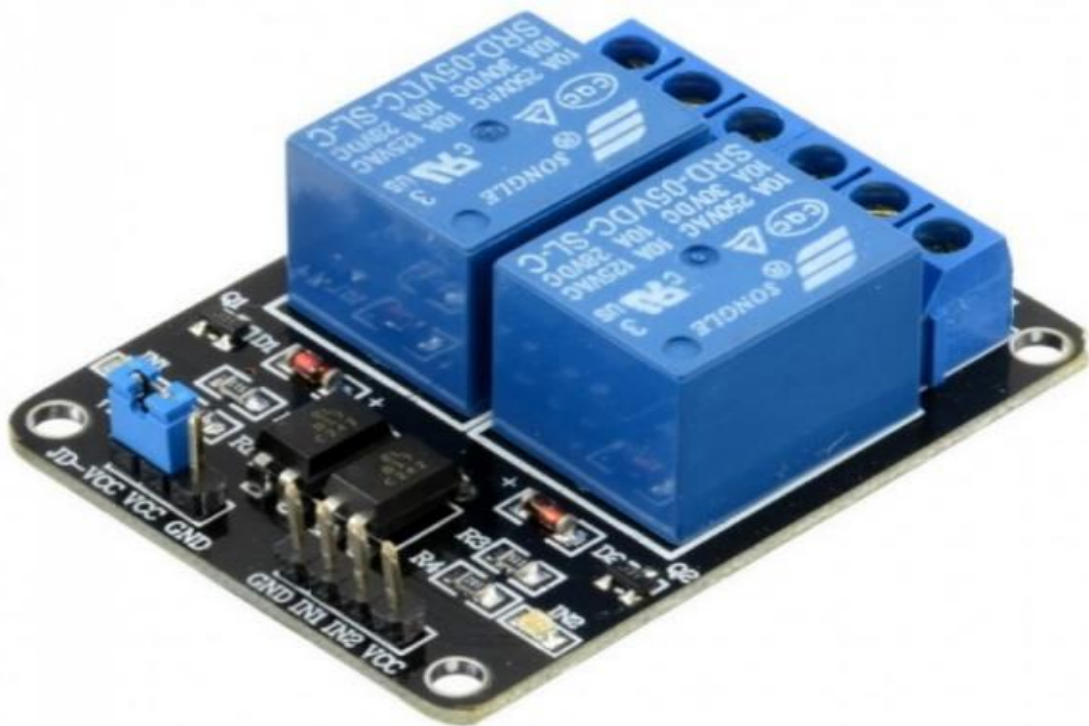


Fig.4.3.9. Relay module

Relays are usually SPDT or DPDT but they can have many more sets of switch

contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on. This lever moves the switch contacts. There is one set of contacts (SPDT) in the foreground and another behind them, making the relay DPDT.

I. GSM MODULE/MODEM

A GSM modem or GSM module is a device that uses GSM mobile telephone technology to provide a wireless data link to a network. GSM modems are used in mobile telephones and other equipment that communicates with mobile telephone networks. They use SIMs to identify their device to the network. The GSM module is shown in Fig.4.3.10.

GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS). A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem. In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like:

- Reading, writing, and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing, and searching phone book entries.

The number of SMS messages that can be processed by a GSM modem per minute is very low -- only about six to ten SMS messages per minute.



Fig.4.3.10. GSM Module

J. DC WATER PUMP

A DC water pump is an electric pump with low voltage. They are quiet and use little power. They are used for many applications, including automotive, household, and water wells. Various DC water pumps are available in the market, including the DC Fountain Pump VP30, a five-volt mini water pump perfect for a solar fountain. Fig.4.3.11. depicts the DC water pump. You can also find DC Submersible Pumps

VP30A and VP40A for aquariums, tabletop crafts, and even fish tanks. DC water pumps are small pumps powered by a battery, dc power supply, or solar panel. Their primary use is to circulate, pressurize, and emulsify liquids. They are particularly useful in environments where water is in short supply. If you're interested in automating your watering system, you can buy a DC Water Pump Kit. This device can deliver water to up to four plants every day, once every "x" days, or even seven days. You'll need a power supply for the pump, often provided externally. Alternatively, you could use a relay and an Arduino Uno to simulate an external switch and turn the small water pump on and off. Safety is one of the main advantages of using this type of pump. It is designed to offer maximum safety thus you can be assured that you will not have any safety issues when operating the pump. The main reason for this is the fact that it normally uses a low voltage power supply. This means that electrical shocks are something that you should not worry about.

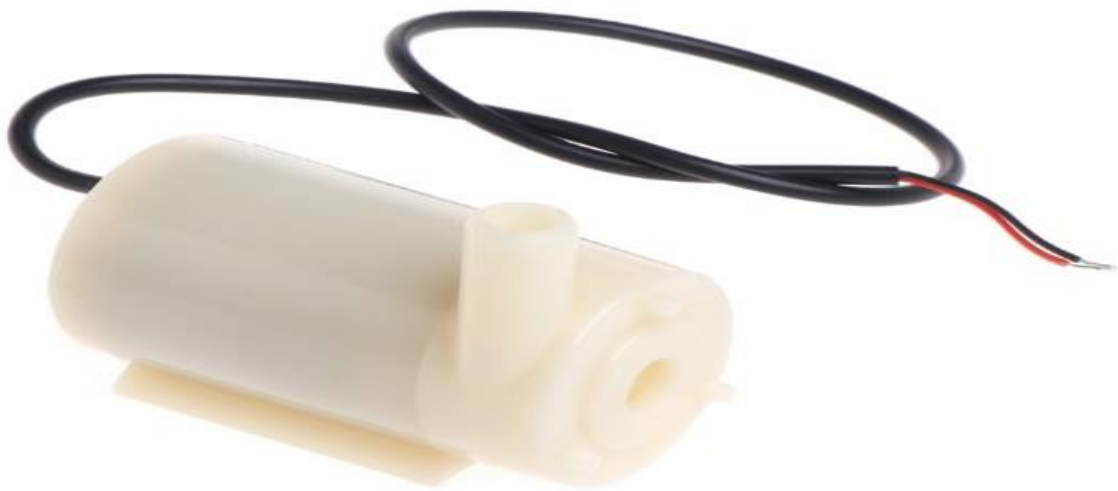


Fig.4.3.11. DC Water Pump

The DC water pump also comes with a variety of great features that make it highly efficient. These include things such as adjustable speed, corrosion resistance, and run-dry capacity. Another advantage you can get from the DC water pump is the fact

that it can be operated easily and conveniently. This means that anyone can do this without any complications. You can operate this straight from the battery. It can also be transported easily to your location of choice allowing you to utilize it in the manner that you wish.

K. LCD DISPLAY

Liquid crystal displays (LCDs) have materials which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal.

An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle. On each polariser is pasted outside the two glass panels. These polarisers would rotate the light rays passing through them to a definite angle, in a particular direction. Fig.4.3.12. depicts the LCD.

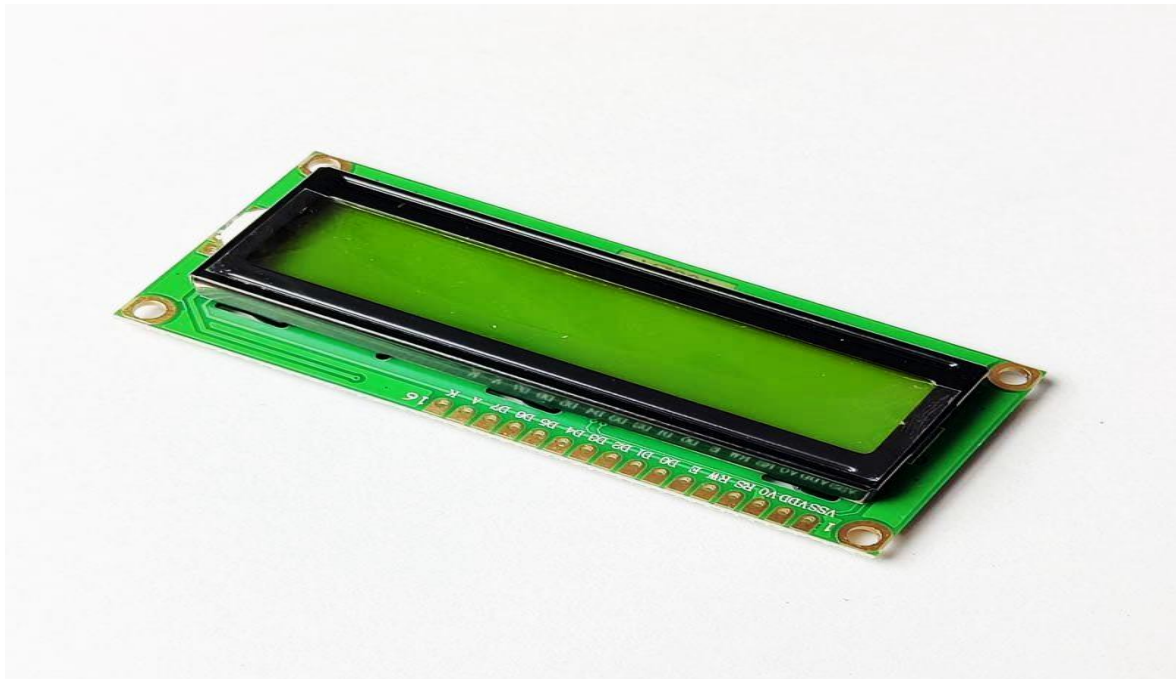


Fig.4.3.12. LCD Display

When the LCD is in the off state, light rays are rotated by the two polarisers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction. The light rays passing through the LCD would be rotated by the polarisers, which would result in activating / highlighting the desired characters. The LCD's are lightweight with only a few millimeters thickness. Since the LCD's consume less power, they are compatible with low power electronic circuits, and can be powered for long durations.

The LCD's don't generate light and so light is needed to read the display. By using backlighting, reading is possible in the dark. The LCD's have long life and a wide operating temperature range. Changing the display size or the layout size is relatively simple which makes the LCD's more customer friendly. The LCDs used exclusively in watches, calculators and measuring instruments are the simple seven-segment displays, having a limited amount of numeric data. The recent advances in technology have resulted in better legibility, more information displaying capability and a wider temperature range. These have resulted in the LCDs being extensively used in telecommunications and entertainment electronics. The LCDs have even started replacing the cathode ray tubes (CRTs) used for the display of text and graphics, and also in small TV applications.

The built-in controller IC has the following features:

- Correspond to high speed MPU interface (2MHz)
- 80 x 8 bit display RAM (80 Characters max)
- 9,920 bit character generator ROM for a total of 240 character fonts. 208 character fonts (5 x 8 dots) 32 character fonts (5 x 10 dots)
- 64 x 8 bit character generator RAM 8 character generator RAM 8 character fonts (5 x 8 dots) 4 characters fonts (5 x 10 dots)

A wide range of instruction functions displays clear, cursor home, display on/off, cursor on/off, display character blink, cursor shift, and display shift.

II. SOFTWARE EXPLANATION

ARDUINO SOFTWARE(IDE)

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer. The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free. The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.



Fig.4.3.13. Arduino IDE

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus. It connects to the Arduino

and Genuino hardware to upload programs and communicate with them. Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension.ino. The editor has features for cutting/pasting and searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. This is what the Arduino ide looks like in Fig.4.3.13.

4.4. PROJECT MANAGEMENT PLAN

Planning is necessary for managing a project in order to carry it out in an organised, accurate, and cost-effective manner. This project is carried out according to the following plan in order to finish it on schedule and produce a good output.

1. *DEFINING PROJECT OBJECTIVES*

The objectives of the project are as follows:

- To fully automate bird farm management.
- To automate labor-intensive tasks in order to decrease the time and effort needed to maintain the farm.
- To study the parameters affecting bird's health and work on rectifying it.
- To help keep the farm owner informed about farm management.
- To prevent the loss of birds by taking the required measures and safety precautions in case of emergency.
- To create a healthy environment for the bird's survival.

2. *SCOPE OF THE PROJECT*

The project's scope includes complete automation of the bird farm, and the Adafruit cloud maintains the value of real-time changes to the parameters so that the owner can view them using a mobile device or a computer. If any mishaps take place on

the farm, the alarm message will notify the owner. The project's overall automation helps reduce manpower expenses and electrical waste. It also aids in preventing accidental bird loss. The project's goal is to create a habitat that is conducive to avian survival.

3. DESIGN

A successful building and implementation process is facilitated by clearly defining the essential criteria and intended objectives for your project. A successful building and implementation process is facilitated by clearly defining the essential criteria and intended objectives for your project. As determined by the objectives, this procedure also entails choosing the hardware that will be used. The project's design is carried out by choosing which aspects of the bird farm will be automated. The fundamental layout is created in a way that considers the factors that affect bird health, how to prevent it, and how to analyse and incorporate all other crucial elements. The communication protocols are chosen in accordance with the evaluated objective, and the final design is processed for the subsequent implementation phase.

4. IMPLEMENTATION

Implementation of the project plan starts once it has been approved. Our goal is to make something challenging simple. Security, performance, and compliance are always taken into account while designing a communication system. With convenience and dependability as our top priorities, we walk you through every stage of integrating communication hardware and software into your product. Implementation entails installing the necessary hardware and software components in accordance with the provided design. Following implementation, testing is conducted.

5. TESTING

Usability, security, performance, and connectivity are the four key factors that are examined during the testing process. We must ensure that each of the devices

utilized here is usable. The devices should display notifications and handle the display in an appropriate manner. Usability testing should cover data display, data processing, and pushing work duties from the devices. IoT is data-centric, meaning that all connected devices and systems depend on the data that is now accessible to function. There is always a possibility that the data could be viewed or read when being moved between devices. When transferring data from one device to another, we need to determine from a testing perspective whether it is secured or encrypted. We must ensure that the system continues to function properly even after the additional data has been spread. Testing the monitoring tool that shows system usage, power usage, temperature, etc. is also important. The system must always be accessible and should be in constant communication with all stakeholders. When it comes to connectivity, it's crucial to test two things: first, when the connection is up and running, data transfer and receiving work tasks from the devices should all be flawless. The situation of a down connection is the other circumstance. There is a potential that the system will go offline, regardless of how reliable the network and system are. We should test the offline scenarios as well because we are testers.

6. MONITORING

Monitoring contributes to keeping such user experiences quick and dependable. Excellent monitoring programmes share a number of characteristics, including: The program's core performance and risk indicators are relevant, and programme owners are adept at making use of data. You have total control over all of your linked devices thanks to our web-based service interface. Numerous features are available on the service site, such as SIM-Management, Real-time Traffic Surveillance and Alert Functions, Statistics, and Diagnostics. With the use of the cloud, real-time monitoring facilitates more effective and simple farm management from anywhere.

7. RISKS

The following risks have been identified for the project:

- *Reliability risks:* The complex web of connections between devices could lead to outages or other problems.
- *Interoperability risks:* The different types of devices and systems that make up

the Internet of Things might not be compatible with each other, leading to difficulties in integrating them.

- *Costs risks:* The costs of developing and deploying the technology, as well as the ongoing costs of maintaining it, could be higher than expected.

8. RISK MANAGEMENT

To mitigate the risks identified in the project, the following risk management strategies will be implemented:

Reliability risks:

- Reducing reliance on single points of failure: In order to ensure reliable operation of internet-connected devices, it is important to reduce or eliminate single points of failure. This can be accomplished through redundancy and diversification of components and systems.
- Design for robustness and flexibility: Another key consideration is to design devices and systems that are robust and flexible enough to accommodate changes in conditions and environment. This will help ensure that the system can continue to function reliably even as conditions change.

Interoperability risks:

- Create clear and concise documentation for all hardware and software components, detailing how they should be used together. This can help to avoid confusion and ensure that everyone is on the same page.
- Develop contingency plans in case of failure or unexpected behavior.

Costs risks:

- Review the budget regularly and make changes as needed.
- Create a reserve fund to cover unexpected costs.
- Plan ahead and stay within budget as much as possible.

4.5. FINANCIAL REPORT ON ESTIMATED COSTING

HARDWARE REQUIREMENTS	COST
Arduino Nano microcontroller	Rs. 579
NodeMCU microcontroller	Rs.485
DHT11 Temperature and humidity sensor	Rs.210
MQ2 Gas sensor	Rs.260
Vibration sensor	Rs.220
IR flame sensor	Rs.255
LDR sensor module	Rs.199
LED	Rs.179
Relay module	Rs.229
GSM Module	Rs.1039
DC Water pump	Rs.129
LCD Display	Rs.413
Circuit board	Rs.179
Jumping wires	Rs.129
DC power supply adapter	Rs. 229
Charger adapter for Arduino	Rs. 299
TOTAL	Rs.5033

CHAPTER 5

IMPLEMENTATION DETAILS

5.1. DEVELOPMENT AND DEPLOYMENT SETUP

SETTING UP THE ARDUINO IDE TO PROGRAM THE NODEMCU: PART 1

To prepare the ESP8266 for programming, the latest version of the Arduino IDE must first be downloaded from the official website. Upon installation of the program, navigate to the Preferences menu under the File tab, and input the following URL: "http://arduino.esp8266.com/stable/package_esp8266com_index.json" in the Additional Board Manager URLs field. This step is necessary to enable access to the ESP8266 boards within the Arduino IDE.

SETTING UP THE ARDUINO IDE TO PROGRAM THE NODEMCU: PART 2

Open the Boards manager which is located in Tools > Board Menu > Boards Manager

SETTING UP THE ARDUINO IDE TO PROGRAM THE NODEMCU: PART 3

After downloading the Arduino IDE and setting it up to program the ESP8266, the next step is to search for and install the ESP8266 platform using the Board Manager feature within the Arduino IDE. Once installed, it is important to select the appropriate ESP8266 board under the Tools menu to ensure compatibility with the programming environment.

SETTING UP THE ARDUINO IDE TO PROGRAM THE NODEMCU: PART 4

Finally, hover over the Tools menu and go to Tools ---> Board ---> and select the NodeMCU 0.9 (ESP-12 Module) board if you are using a NodeMCU V0.9 board, or the NodeMCU 1.0 (ESP-12 Module) board if you are using a NodeMCU V1.0 board.

CONNECTION OF SENSORS TO THE NODEMCU:

The nodemcu microcontroller is connected to all of the sensors. DHT11 sensor is utilised as a temperature and humidity sensor. LDR sensors are employed in lighting automation. To detect fires, a fire sensor is employed. Flying fish MQ2 gas sensor is utilised for gas detecting. Ultrasonic sensors are set up with the intention of

determining the availability of food and water. We employ vibration sensors, also known as piezometric sensors, for the aim of sensing theft. All of the aforementioned sensors have relay modules installed, which will aid in handling a voltage shortfall. For the purpose of the control unit, all of these are connected to the Arduino Nano. For modifications in the DHT11 sensor and fire sensor, the connections also feature connections with a DC fan. The LDR sensor's purpose is served by an LED. For mobile communication, a GSM module is additionally attached to the Arduino Nano via a relay module. For the purpose of pumping water, a DC water pump is connected, and it operates in accordance with the outputs of the ultrasonic sensors.

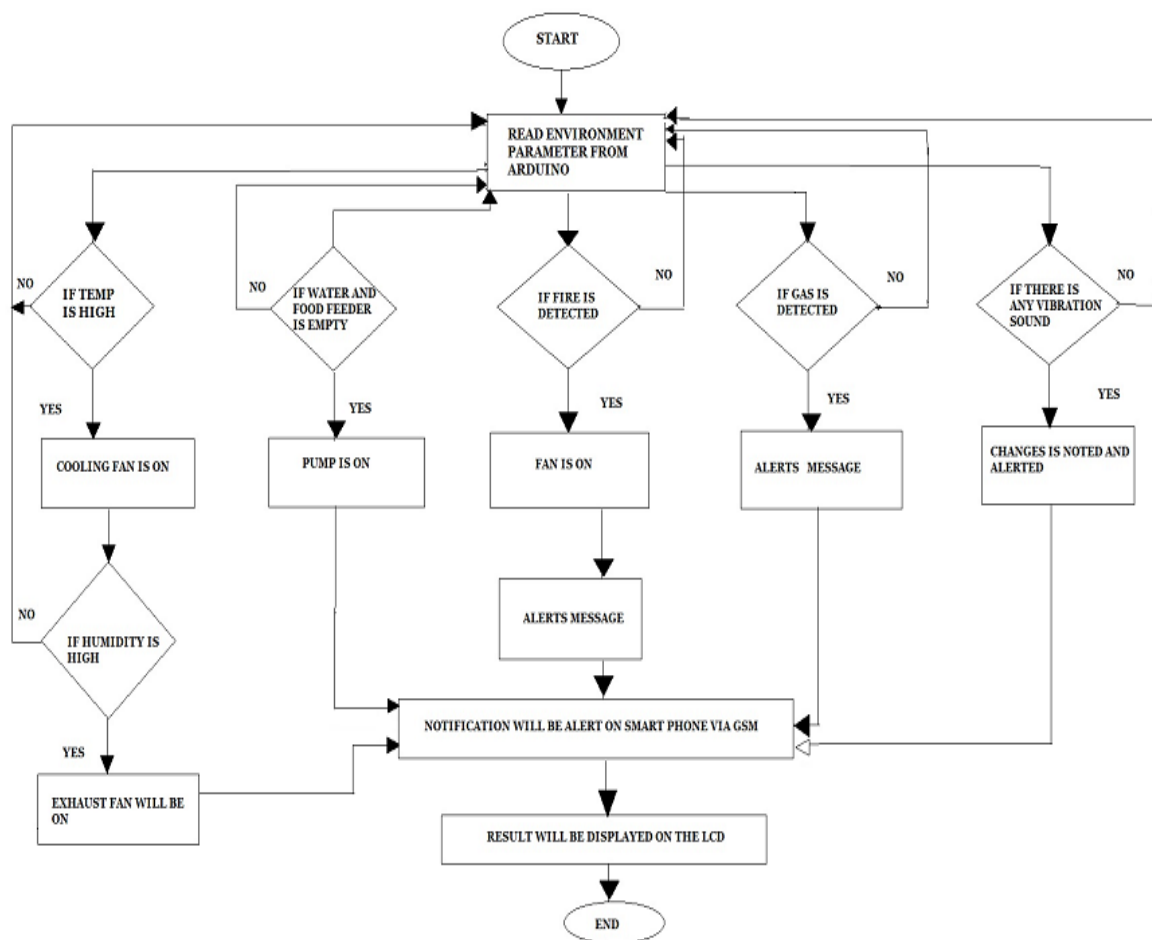


Fig.5.1. Proposed approach's flowchart

5.2. TESTING

IoT testing involves executing QA tests to check IoT devices' functionality, security, and performance. It is crucial to ensure that your IoT devices can transmit sensitive

information wirelessly before going to market because every IoT device sends and receives data over the Internet. Because of this, many IoT businesses rely on IoT automation, penetration, and performance testing tools to detect defects before reaching consumers.

Usability Testing: There are so many devices of different shapes and forms of factors used by users. Moreover, the perception also varies from one user to other. That's why checking the usability of the system is very important in IoT testing.

Compatibility Testing: There are lots of devices that can be connected throughout the IoT system. These devices have varied software and hardware configuration. Therefore, the possible combination is huge. As a result, checking the compatibility in the IOT system is important.

Reliability and Scalability Testing: Reliability and Scalability are important for building an IOT test environment that involves the simulation of sensors by utilizing virtualization tools and technologies.

Data Integrity Testing: It's important to check the Data integrity in IOT testing as it involves a large amount of data and its application.

Security testing: In the IOT environment, there are many users accessing a massive amount of data. Thus, it is important to validate users via authentication and have data privacy controls as part of security testing.

Performance Testing: Performance testing is important to create a strategic approach for developing and implementing an IOT testing plan.

We conducted tests with different criteria. Under the heading of components validation, we have carried out a number of tests including device hardware, embedded software, network connectivity, and sensor testing. We conducted tests with different criteria. Under the heading of components validation, we have carried out a number of tests including device hardware, embedded software, network connectivity, and sensor testing.

CHAPTER 6

RESULTS AND DISCUSSIONS

Fig. 6.1. shows the final prototype and outcome of the suggested system. Every time modifications are discovered, the owner is notified immediately.

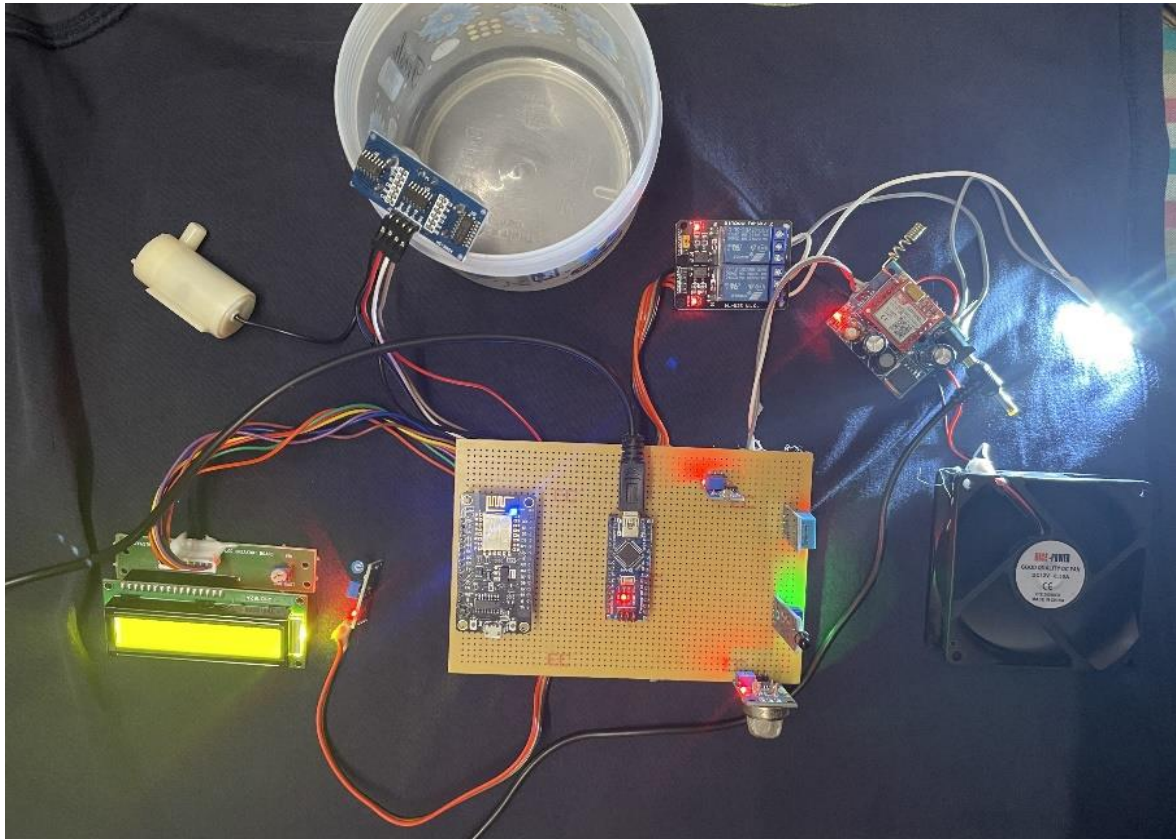


Fig.6.1. Complete Hardware product

In the event of a fire, gas leak, or attempted theft, an SMS is delivered to the owner's mobile device. As a result, the owner receives updates regarding the cloud-based real-time monitoring of parameter changes. Temperature, humidity, gas detection, fire detection, LDR, and vibration sense are the values that are displayed on the LCD as shown in Fig.6.2..

The ideal temperature is kept between 40 and 41 degrees Celsius, so if the temperature rises, a cooling fan is activated until the environment reaches the ideal temperature. The humidity level is also maintained at its ideal level. Any smoke or gas produced is detected by the gas sensor. The ideal value is maintained at 400, thus if there is an increase in value above 400, a message alerting that gas has

been detected is issued. LDR values will fall between 800 to 1023.

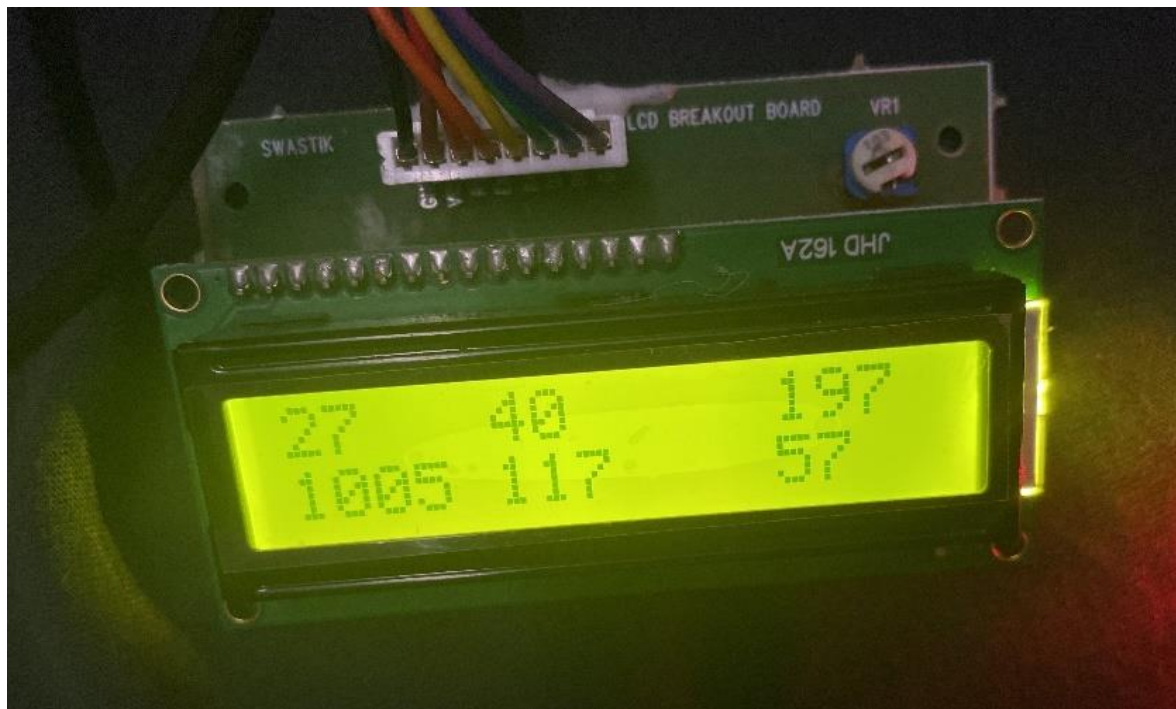


Fig.6.2. LCD

The Adafruit cloud displays and stores every change that we see on an LCD display as shown in Fig.6.3. The owner can use a computer or mobile device to record it in real time. The gsm module also sends him updates and alerts via SMS.

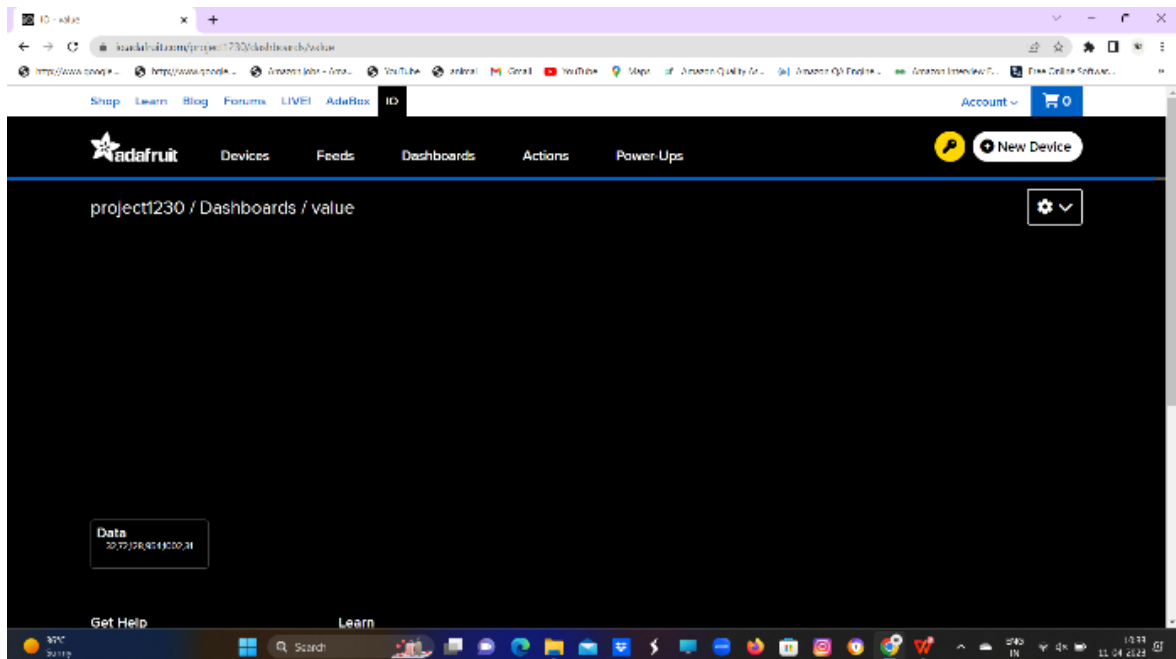


Fig.6.3. Data's displayed in Adafruit cloud

CHAPTER 7

CONCLUSION

7.1. CONCLUSION

Thus, installing a low-cost smart device on the farm may provide numerous benefits to the poor farmer while also improving farm output. It aids in maintaining a safe environment for the survival of the birds. The adequate provision of food and water aids in preventing the spread of infections that could harm the bird. It will also be a factor in preventing disease spread. It assists with the labor-free operation of bird farms and reduces electricity waste. The suggested technique assisted in supplying the appropriate actions on the factors affecting bird health and also protected from theft and fire mishaps. It aided in supplying a bird-friendly environment. The proposed system improved bird management and observation. This promotes the health and growth of birds. This will be a solution for the following Sustainable Development Goals: Poverty Eradication, Good Health and Well-Being, Clean Water and Sanitation, Decent Work and Economic Growth, and Climate Action.

7.2. FUTURE WORK

Since our proposed system has many automated characteristics, some additional tasks are carried out manually by workers. Since water is a vital component for birds' survival, we will focus on improving the quality of the water that is delivered to them in future years. They could get some water-borne infections if the water is polluted. We shall focus on water quality as our future Work in order to achieve this. In addition to this, we'll put in place a smart nest box to track the parent's nestling movements and give them a safe place to raise their young.

7.3. RESEARCH ISSUES

Here are some potential research issues in an IoT-based smart management system for a bird farm project:

- *Sensor selection and deployment:* The selection and deployment of appropriate

sensors are critical for collecting accurate and useful data. Research can be conducted to identify the most suitable sensors for monitoring bird health, environmental conditions, and energy consumption.

- *Data management and analysis:* The system generates a large amount of data that needs to be managed and analyzed effectively. Research can be conducted to develop efficient data management and analysis techniques that can provide actionable insights to farm managers.
- *Wireless communication and network reliability:* The IoT sensors and devices used in the system rely on wireless communication and networking to transmit data. Research can be conducted to ensure the reliability and security of wireless communication networks, especially in remote or rural areas where connectivity can be a challenge.
- *Power management and sustainability:* IoT devices and sensors require a steady power supply to function. Research can be conducted to explore sustainable power options for these devices, such as solar power or energy harvesting.
- *User interface and interaction design:* The system needs to be easy to use and interact with for farm managers and workers. Research can be conducted to design an intuitive user interface that allows for efficient management of the bird farm.
- *Ethics and animal welfare:* As the system involves the monitoring and management of living animals, ethical considerations and animal welfare must be taken into account. Research can be conducted to identify and address ethical concerns and ensure that the system does not compromise animal welfare.

Overall, research in these areas can help to address the challenges associated with developing an IoT-based smart management system for a bird farm and ensure that the system is effective, reliable, and sustainable.

7.4. IMPLEMENTATION ISSUES

Implementing the system can present several challenges. Here are some of the common implementation issues that are encountered:

- *Connectivity:* The success of an IoT system largely depends on a robust and reliable network infrastructure. However, bird farms are often located in remote areas, which may not have adequate network coverage. In such cases, you may need to rely on satellite-based communication or deploy local gateways to ensure connectivity.
- *Power consumption:* IoT devices that are designed for continuous monitoring and data collection can consume a significant amount of power. Since bird farms may not have access to a reliable power supply, you may need to explore alternative power sources such as solar or wind power.
- *Sensor placement:* The placement of sensors is critical for accurate data collection. In a bird farm, sensors need to be placed strategically to monitor various environmental factors such as temperature, humidity, and lighting. Ensuring that sensors are placed in the right locations and that they are functioning correctly can be a challenge.
- *Data management:* IoT systems generate a massive amount of data, and managing this data can be a daunting task. It is essential to have a robust data management system in place to ensure that the data is collected, processed, and analyzed efficiently. The system should also have the capability to store the data securely and provide easy access to it.
- *Integration:* Integrating various IoT devices and platforms can be challenging, especially if they are from different manufacturers. Ensuring that all devices can communicate with each other seamlessly can be a significant hurdle that needs to be overcome.
- *Security:* With the increasing number of connected devices, IoT systems are becoming more vulnerable to cyber-attacks. Securing the system against hacking, malware, and other security threats is crucial for the successful implementation of an IoT-based smart management system for a bird farm.

In summary, implementing IoT-based smart management for a bird farm can present several challenges, ranging from connectivity and power consumption to data management and security. Overcoming these challenges requires careful planning, implementation, and ongoing management of the system.

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APPENDIX

A. SOURCE CODE

```
#include <ESP8266WiFi.h>
#include <WiFiClientSecure.h>
String readString;
const char* ssid = "project1";
const char* password = "project1";
const int httpsPort = 443;

int cnt;

int t;

int h;

int MQ2=0;

int flame=0;

int sms=0;

int time_now=0;

int time_prev=0;

int Secs = 0;

int Mins = 0;

int Hours = 0;

bool change_update = false;

bool change_updat_min = false;


int a1=0;

char data = 0;           //Variable for storing received data
```

```

void setup()

{
    Serial.begin(9600);
    mySerial.begin(9600);
    LCD.begin(20, 4); // LCD 16X2


    //pinMode(10, INPUT);
    pinMode(8, OUTPUT);
    digitalWrite(8, HIGH);

}


void loop()

{
    count_time();

    h = dht.readHumidity();
    t = dht.readTemperature();

    MQ2=analogRead(A0);
    flame=analogRead(A1);


    LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print(t); //Print Message on First Row
    LCD.setCursor(5,0); //Set LCD cursor to upper left corner, column 0, row 0
    LCD.print(h); //Print Message on First Row

```

```

LCD.setCursor(12,0); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print(MQ2); //Print Message on First Row

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print("  "); //Print Message on First Row

LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0

LCD.print(flame); //Print Message on First Row

```

```

if(flame<300 || MQ2>400)
{
  if(sms==0)
  {
    Serial.println("AT+CMGF=1"); //Sets the GSM Module in Text Mode

    delay(1000); // Delay of 1000 milli seconds or 1 second

    Serial.println("AT+CMGS="+919994985122+"\r"); // Replace x with mobile
number

    delay(1000);

    Serial.print("ALERT !! ");

    delay(100);

    Serial.println((char)26); // ASCII code of CTRL+Z

    delay(1000);

    Serial.println("sms sent"); // ASCII code of CTRL+Z

    sms=1;
  }
}

```

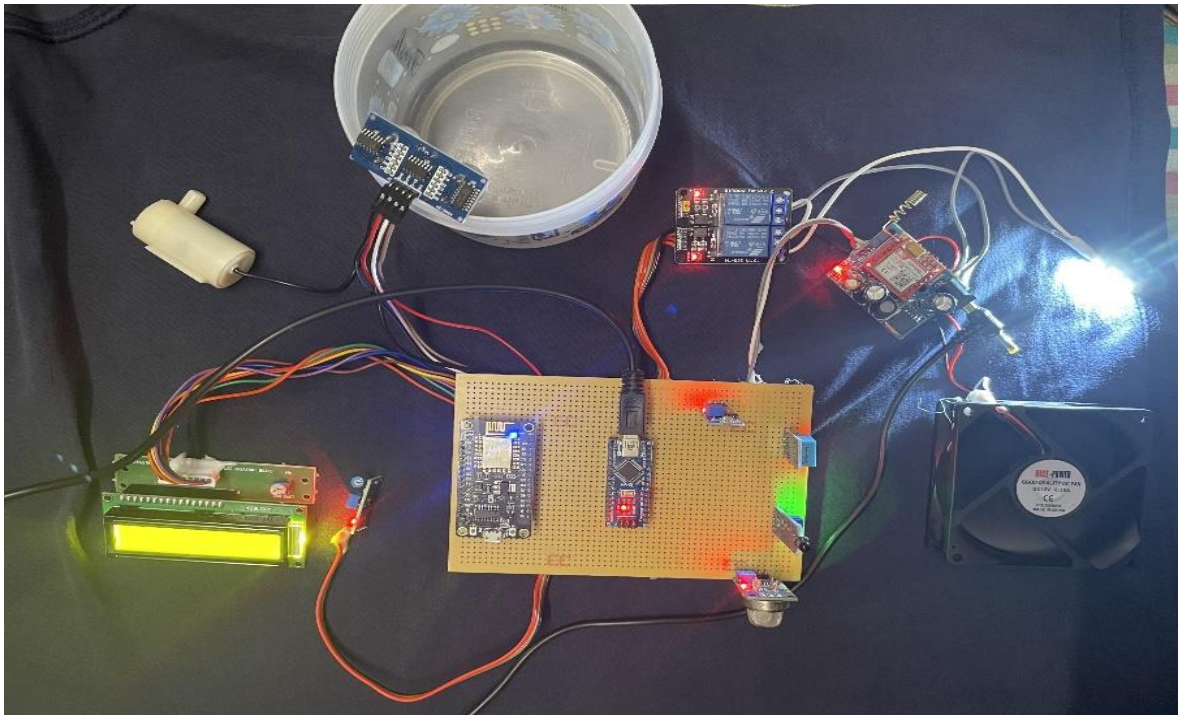
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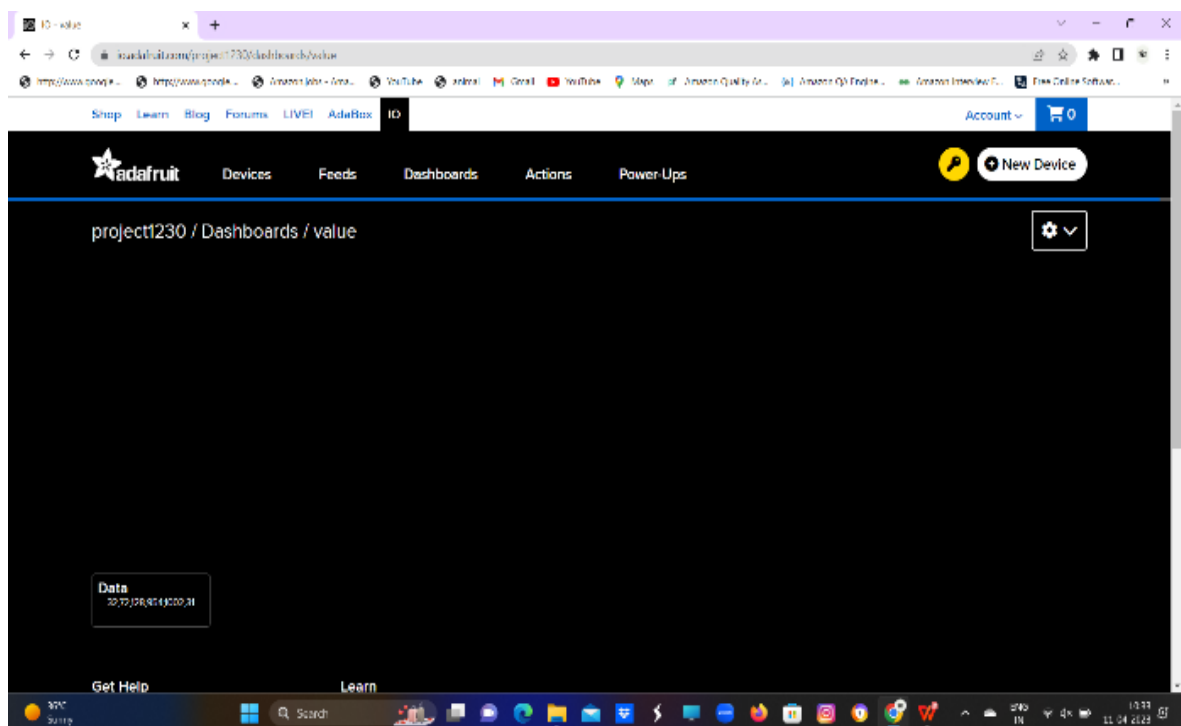
}

    if(change_update == true)
    {
        mySerial.print("*");
        mySerial.print(t);
        mySerial.print(",");
        mySerial.print(h);
        mySerial.print(",");
        mySerial.print(MQ2);
        mySerial.print(",");
        mySerial.print(flame);
        mySerial.println("#");
        Serial.println("ud");
        change_update = false;
    }
    delay(300);
}

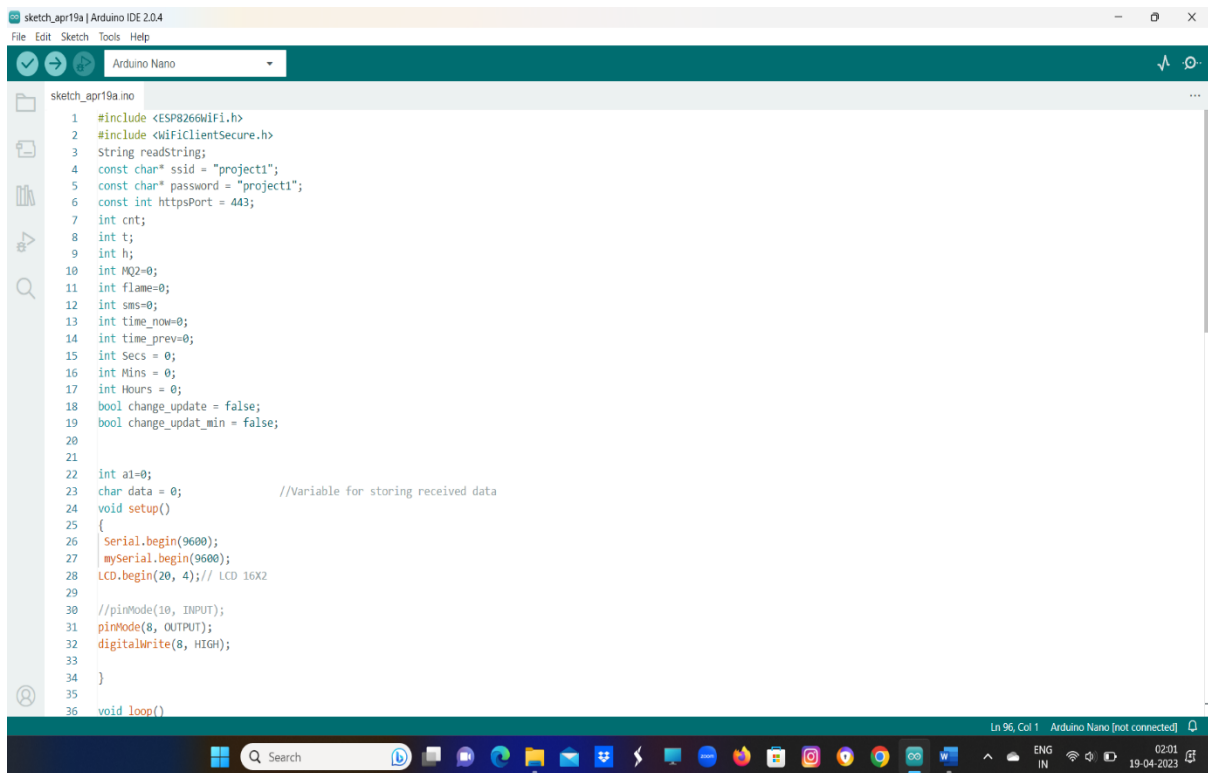
```

B. SCREENSHOTS



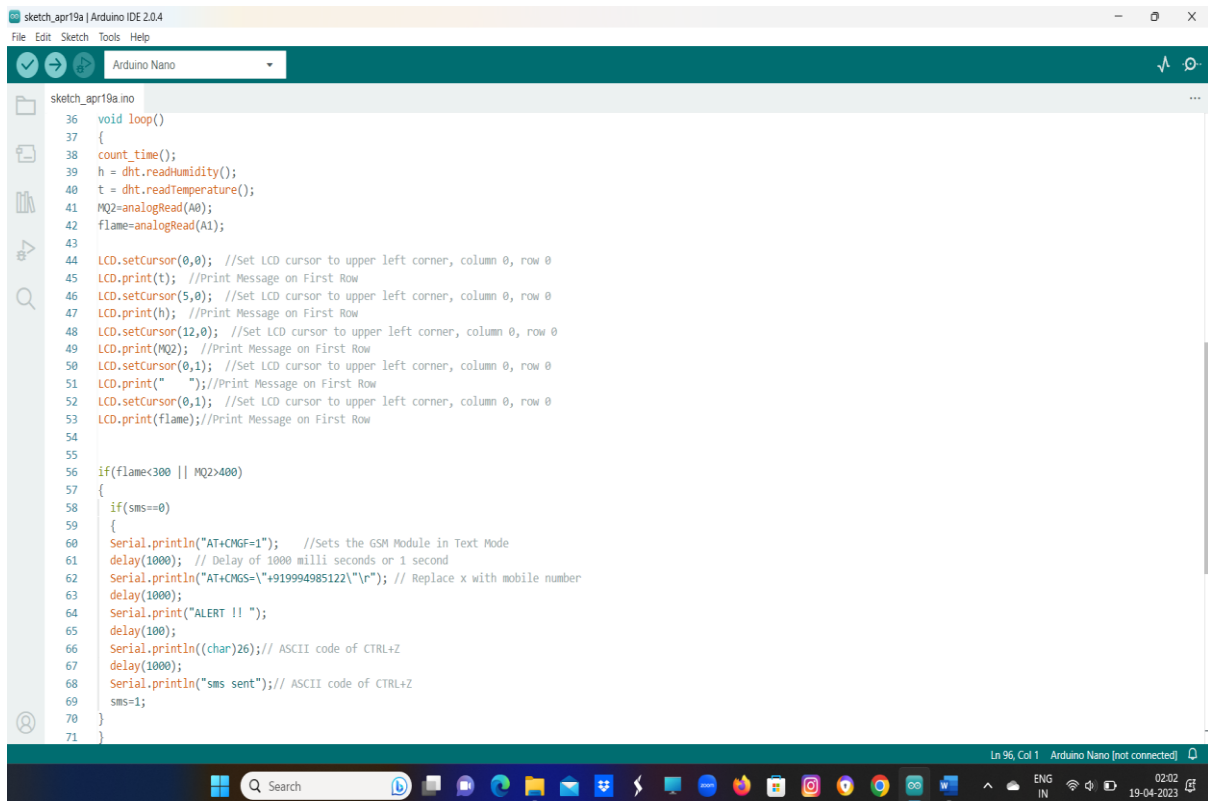


CODE SCREENSHOTS



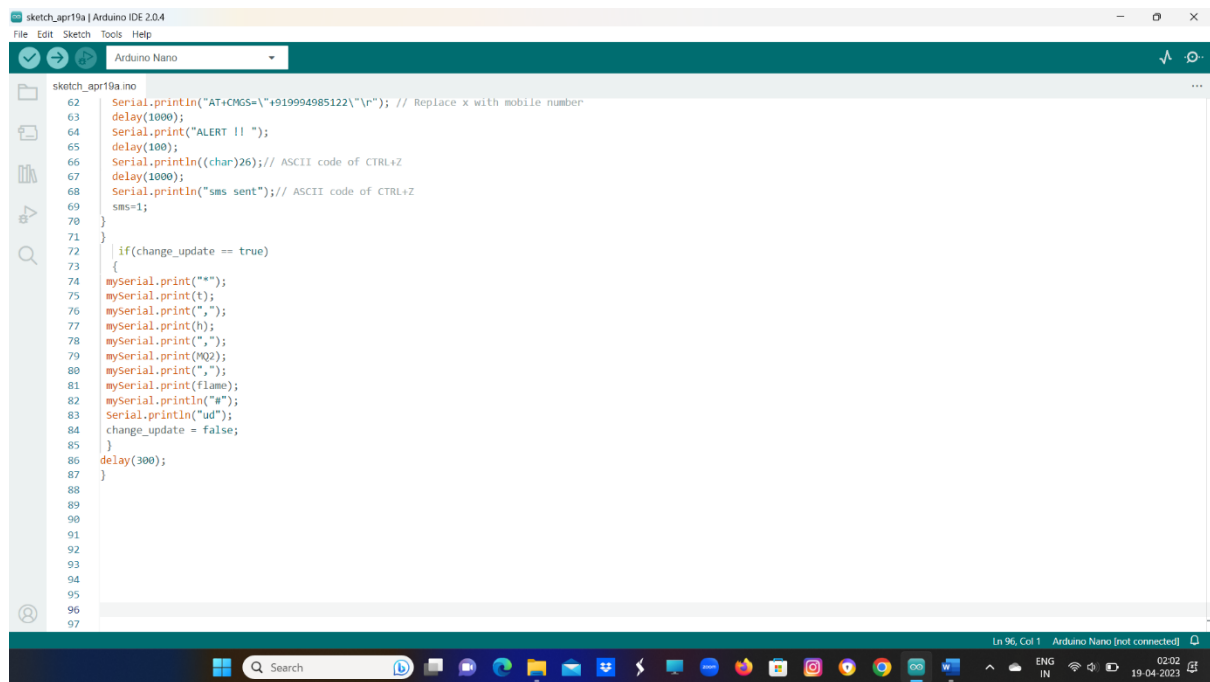
```
sketch_apr19a | Arduino IDE 2.0.4
File Edit Sketch Tools Help

sketch_apr19a.ino
1 #include <ESP8266WiFi.h>
2 #include <WiFiClientSecure.h>
3 String readString;
4 const char* ssid = "project1";
5 const char* password = "project1";
6 const int httpsPort = 443;
7 int cnt;
8 int t;
9 int h;
10 int MQ2=0;
11 int flame=0;
12 int sms=0;
13 int time_now=0;
14 int time_prev=0;
15 int secs = 0;
16 int Mins = 0;
17 int Hours = 0;
18 bool change_update = false;
19 bool change_updat_min = false;
20
21
22 int a1=0;
23 char data = 0; //Variable for storing received data
24 void setup()
25 {
26   Serial.begin(9600);
27   mySerial.begin(9600);
28   LCD.begin(20, 4); // LCD 16X2
29
30   //pinMode(10, INPUT);
31   pinMode(8, OUTPUT);
32   digitalWrite(8, HIGH);
33
34 }
35
36 void loop()
```



```
sketch_apr19a | Arduino IDE 2.0.4
File Edit Sketch Tools Help

sketch_apr19a.ino
36 void loop()
37 {
38   count_time();
39   h = dht.readHumidity();
40   t = dht.readTemperature();
41   MQ2=analogRead(A0);
42   flame=analogRead(A1);
43
44   LCD.setCursor(0,0); //Set LCD cursor to upper left corner, column 0, row 0
45   LCD.print(t); //Print Message on First Row
46   LCD.setCursor(5,0); //Set LCD cursor to upper left corner, column 0, row 0
47   LCD.print(h); //Print Message on First Row
48   LCD.setCursor(12,0); //Set LCD cursor to upper left corner, column 0, row 0
49   LCD.print(MQ2); //Print Message on First Row
50   LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
51   LCD.print(" "); //Print Message on First Row
52   LCD.setCursor(0,1); //Set LCD cursor to upper left corner, column 0, row 0
53   LCD.print(flame); //Print Message on First Row
54
55
56   if(flame<300 || MQ2>400)
57   {
58     if(sms==0)
59     {
60       Serial.println("AT+CMGF=1"); //Sets the GSM Module in Text Mode
61       delay(1000); // Delay of 1000 milli seconds or 1 second
62       Serial.println("AT+CMGS=\"+919994985122\\\""); // Replace x with mobile number
63       delay(1000);
64       Serial.print("ALERT !! ");
65       delay(100);
66       Serial.println((char)26); // ASCII code of CTRL+Z
67       delay(1000);
68       Serial.println("sms sent");// ASCII code of CTRL+Z
69       sms=1;
70     }
71   }
```



```
sketch_apr19a.ino
62 Serial.println("AT+CMGS=\"+919994985122\"\\r\\n"); // Replace x with mobile number
63 delay(1000);
64 Serial.print("ALERT !! ");
65 delay(100);
66 Serial.println((char)26); // ASCII code of CTRL+Z
67 delay(1000);
68 Serial.println("sms sent"); // ASCII code of CTRL+Z
69 sms=1;
70 }
71 }
72 if(change_update == true)
73 {
74   mySerial.print("**");
75   mySerial.print(t);
76   mySerial.print(",");
77   mySerial.print(h);
78   mySerial.print(",");
79   mySerial.print(MQ2);
80   mySerial.print(",");
81   mySerial.print(flame);
82   mySerial.println("M");
83   Serial.println("ud");
84   change_update = false;
85 }
86 delay(300);
87 }
88
89
90
91
92
93
94
95
96
97
```

C. RESEARCH PAPER

IoT-BASED SMART MANAGEMENT OF BIRD FARM

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Abstract—Birds enrich our lives with color, song, and joy. It calms down stressed individuals of all ages. Farmers now have the profitable business option of raising birds. In India, there are thought to be 30 million farmers that raise birds. In Tamil Nadu, there are about 300,000 farms. There are about 2000 different species of birds. A few factors that affect bird farms include climate change, habitat degradation, and declining food supply. This farm also has difficulties with incorrect feeding, bird health, and security issues including theft. A lot of daily regular work is required to maintain a bird farm, including routine bird watching, health monitoring, feeding, local hygiene, and other duties. Birds get sick from unhygienic maintenance, which can be lethal. Massive losses can occur if an illness in one bird spreads to the entire farm. Losses are also due to farm fires and can also be brought on by the farm being infected with hazardous gases. Water is the main source of avian disease. These criteria could cause this business to suffer a substantial loss. Therefore, it is essential to preserve and safeguard them. To get around this, the farm might be automated based on variables like the environment's temperature and humidity, water level, and water quality.

Keywords—Internet of things, wireless sensors, Automation, Sensors

I. INTRODUCTION

Climate change, habitat degradation, and dwindling food supplies are several threatening parameters for bird farms. Other challenges faced by this farm include improper feeding, bird health, and safety measures such as theft. Maintaining a bird farm requires a lot of daily routine work such as routine bird watching, health monitoring, feeding, local hygiene, and so on. Unsanitary maintenance causes illness in birds, which can be fatal. A disease in one bird can spread to the entire farm, resulting in massive losses. These parameters may result in a significant loss in this business. As a result, it is critical to conserve and protect them. To overcome this, the farm could be automated based on certain parameters such as water level and water purity. Environmental variables such as air temperature and humidity must be monitored and their effects studied in the long run to gain knowledge. Because the bird farm is spread out over such a large area, a lot of electricity and laborers are required to keep it running. The cost of electricity, and maintaining them is also prohibitively expensive. Sometimes the carelessness of the workers on these farms wastes energy and other resources, resulting in financial loss. An automated bird farm solves this problem by preventing from losing resources. The other difficult concerns about safety and security include bird theft, farm fires, and keeping safe from other domestic animals such as cats. Another major concern is the health and hygiene of the farm's animals. Clean water

and sanitation are critical for the well-being of birds because impurities and contaminated water can genetically manipulate the sick and spread those illnesses to other birds, potentially resulting in a significant loss of birds. The quality of water must be improved in order to provide clean water to birds. To address this, the farm could be automated based on parameters such as water level and purity. There are also issues such as varying climate actions that have an impact on the health of the birds; some birds cannot tolerate cold climates, resulting in their death. Bird health is significantly impacted by temperature and humidity. For farm owners, the loss of birds could mean a huge financial loss. All of these difficulties must be made clear in order to run a large bird farm.

II. LITERATURE SURVEY

A. IOT-BASED SMART AUTOMATED POULTRY FARM MANAGEMENT SYSTEM – 2022

Author: Bharati Ramteke, Snehlata Dongre

Internet of Things-based intelligent automated system for managing poultry. To feed and hydrate birds, the approach makes use of internal sensors. When dihydrogen monoxide levels are low, the alert sounds. A sensor on the chicken farm regulates the lighting. A pure dihydrogen monoxide supply, automatic meal delivery, and egg storage are all possible with this technology. As a result of poor management and care of poultry farms, the authors of this study proposed a method for producing salted birds and lowering the death rate of hens. They believe that efficient management and productivity are identical to ongoing supervision. In order to enable the system to autonomously interact with sensors, it makes use of IoT components in its implementation. The user gets the alert notification in the form of a text message. The web interface is made to monitor all outcomes.

B. IOT-BASED SMART MANAGEMENT OF POULTRY FARM AND ELECTRICITY GENERATION - 2018

Author: Kadam Anaji Sitaram, KinjawadEkar Rasika Ankush, Kadam Nikhil Anant, Bane Raman Raghunath

The goal of this article is to automate management tasks on a chicken farm using IoT technologies. Manual tasks like food feeding, water supply, and sanitation are managed, as are environmental factors that have an impact on chicken health. Additionally, methane gas created from chicken dung and stored in batteries is used to generate electricity. A web-based system that maintains track of the management of poultry farms from anywhere and at any time can also be used for farm management and monitoring. The Arduino Uno is

connected to all of the sensor modules, and after the sensor readings are collected, the GPRS module is used to upload the data to the website. As a result, the owner or manager of the farm may examine the farm's internal environment online using a computer or mobile device.

C. IOT-BASED SYNERGISTIC APPROACH FOR POULTRY MANAGEMENT SYSTEM - 2021

Author: Moses Oluwafemi onibonoje

IoT is a new technology that connects sensors, personal computers, and other devices to communication infrastructure and the internet using software to enable autonomous activities free from human interference. IoT is ready to have a significant impact on the agri-food industry and develop into a key component of a modern chicken farm. When IoT is used in smart poultry production, internet-based gadgets will act autonomously and people will only step in when doing so requires a higher level of intelligence. The use of radiofrequency tags in poultry systems is also highly beneficial for tracking the frequency of feeding, the frequency of egg production, and the health of the birds.

D. IoT-BASED POULTRY HOUSE MONITORING SYSTEM - 2019

Author: V.V. SANTHOSH KUMAR¹, S. SEENUVASAN, S. SHAJITH BAIG, T. VIMALESH, M. SHANTHI

The approach shows how innovative technologies can be designed to give control and monitoring over vast areas and over extended periods of time. To make sure everything is running smoothly, the temperature and humidity conditions in a chicken house should be checked periodically. Security is increased by using an RFID reader and tag. The internal temperature of the chicken was measured using a temperature sensor.

E. IOT BASED POULTRY HOUSE MONITORING - 2019

Author: Noridayu Manshor, Amir Rizaan Abdul Rahiman

Lately, incalculable Internet resources have been added to the utilization of IoT (Internet of Things)-based systems. The system serves as an example of how creative systems can be developed to provide control and monitoring over large areas and over long periods of time. Temperature and humidity levels in a chicken house should be checked frequently to make sure everything is working properly.

F. IOT BASED SMART POULTRY FARM - 2019

Author: Ayyappan. V, Deepika. T, Divya Dharshini. S, Elayaraja. M, Shanmugasundaram. R

The primary goal of this technology is to automate poultry farms using WSN and mobile communication systems. The environmental factors of a poultry farm are routinely tracked and managed in this study to promote chicken growth, including temperature, humidity, and ammonia gas. With the aid of the sensor module, the water level may also be managed and watched. All sensor readings are collected by the microcontroller, and using a wifi module, the readings are updated on the website. It will turn on the gadgets based on the minimum and maximum values.

G. REMOTE MONITORING AND CONTROL OF POULTRY FARMS USING IOT TECHNIQUES - 2018

Author: Eric Hitimana, Gaurav Bajpai, Richard Musabe,

Louis Sibomana

This study focuses on automating the chicken farming sector so that the amount of physical labor can be decreased. Regular monitoring of climate change results in prompt management of those changes. In addition to ensuring that the chickens receive regular water supplies, water management mechanisms assist prevent water wastage. The suggested approach will improve productivity, lessen environmental diseases that impact chickens, and get rid of a lot of workers who might make mistakes. The data analysis can also be considered by the approach.

H. SMART POULTRY FARM INCORPORATING GSM AND IOT - 2020

Author: Md. Mahfujul Islam, Shaharya Sourov Tonmoy, Sazzad Quayum, Al Russel Sarker, Sumaiya Umme Hani, Mohammad Abdul Mannan

Modern chicken farms can liberate farmers from time-consuming and outmoded traditional tiresome practices. A smart poultry farm has numerous distinguishing characteristics at this early level, including automation in the delivery of water and food, collecting eggs, maintaining accurate environment parameters, etc. Security precautions have been implemented, including fire protection and anti-theft features that guarantee a comprehensive watch over the farm. Automation has several advantages, including reduced labor expenses, lower maintenance costs, lower overall material prices, and an increase in a particular product's quality, accuracy, and precision.

I. IOT-BASED SMART WEATHER MONITORING SYSTEM FOR POULTRY FARM-2020

Author: Jenny Priyanka mondol, Khan Raqib Mahmud, Muhammad golam kibria

The aforementioned authors created an IoT-based weather monitoring system for a poultry farm, which has been proposed in this system, to improve management and raise the efficiency of the farm. This system keeps track of the weather, food quality, the health of the chickens, and when to feed them. The proposed system's temperature and humidity are measured using DHT11. The information gathered is sent to a cloud-based server, kept in a database, and constantly examined against minimum levels.

J. DEVELOPMENT OF SMART CHICKEN POULTRY FARM USING RTOS ON ARDUINO-2019

Author: Teddy Surya Gunawan, Mohamad Firdaus Sabar, Haidawati Nasir, Mira kartiwi, S.M.A.Motakabber

IoT for precision agriculture can be used to create an active monitoring system that maintains the ideal environmental conditions, including temperature, CO₂, ammonia, and humidity. Following the use of a range of sensors to track the ammonia and CO₂ levels, dc fans are going to be employed to keep them to the optimal level. Additionally recorded and regulated by a DC fan and heat lamp will be the humidity and temperature.

III. EXISTING SYSTEM

Traditional bird farms require a lot more labor and are difficult to run. The following are a few drawbacks of conventional bird farms: It is impossible to monitor the

various parts of the farm using a single dashboard. There are no controls for the farm's temperature or humidity. In a bird farm, high temperatures are one of the most important environmental stressors and can result in significant losses. The air shouldn't be excessively dry or humid in the same manner. The ideal temperature and humidity levels inside the farm cannot be maintained by typical farms. There is no automation involved in tasks like the delivery of water; everything is done manually. Since water is essential to a bird's survival, there is no quality control of the water provided to them. There is no system in place to inform the operator of changes to the farm's status while they are not physically present there. The system is expensive since it has to have trained employees on hand. The breakout of an infection can result in significant pharmaceutical costs due to the farm's ineffective management and unsanitary conditions.

IV. PROPOSED SYSTEM

The smart bird farm in the proposed system significantly improves the traditional farm by turning it into a fully automated system and giving timely feedback to the operator as needed. The following are some of its advantages over the current system: Real-time farm monitoring and wireless actuator control from anywhere in the world are both possible from a single dashboard. The farm's temperature and humidity may be monitored, and the right actuators are available to keep them at their ideal levels. The owners of the farms receive updates regarding their status in real-time. No trained personnel is necessary. This mechanism maintains the temperature and humidity, which contributes to a favorable habitat for the bird to survive. The automated replenishment of food and water supplies eliminates the need for human labor and improves farm maintenance. Water quality is also checked, so if it's poor, the owner receives a message and the system's water is changed. In addition to this, a theft alert for birds is put into place, assisting the owner and warning of lost birds. By decreasing labor requirements and ensuring correct maintenance of the bird farm in a welcoming and clean environment, the suggested method fills in the gaps left by the traditional process.

IV. PROPOSED METHODOLOGY

A. Hardware design

The block diagram of the suggested system, which includes a number of remote sensors and microcontrollers, is shown in Fig. 1. Due to its small size, compatibility with current and voltage requirements, and grove pins, the Arduino Nano was chosen as the microcontroller unit. Data is gathered by Arduino Uno from several sensors installed in a bird farm. The GSM module is used by a variety of sensors to connect to the web-based network, including temperature and humidity sensors, water level sensors, IR sensors, light sensors, water quality sensors, and others.

The proposed approach included several sensors, each of which performs a particular function. Environment and water quality make up the bulk of the system on which we concentrate. To monitor the environment, a DHT11 temperature and humidity sensor is deployed. This sensor is

used to identify high temperatures and high levels of humidity. This system has been set up so that it will turn on the heater and fan in accordance with the pre-programmed function when the temperature and humidity are high or low.

The Arduino is equipped with feed availability sensing, which checks the supply of food for birds. It is checked by mounting the IR sensor on top of the food container; as a result, when there is insufficient food, the automatic food pump fills the container; once it is full, it shuts off. Water level sensing is used, much like the approach discussed earlier, to determine how much water is present inside the container. Water pumps fill it up with water when it runs low.

The water quality sensor, which monitors the quality of water kept for the birds, is the other major sensor linked. It examines a number of things, including pH, conductivity, and several other elements involved. If it is discovered to be impure, the owner is notified and is forced to replace the water and maintain excellent quality in order to safeguard the health of the birds.

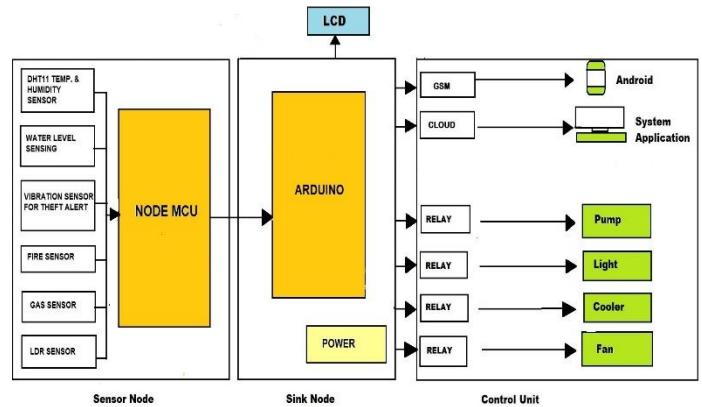


Fig. 1. Block Diagram

The birds' cage has theft warning systems installed at the doors to assist in identifying theft attempts. The alarm system is configured to sound whenever a theft attempt is made, alerting the employers to the situation. This aids in the correct upkeep of the bird farm and the prevention of bird losses.

In order to reach the access node, the processed data from the NodeMCU is transmitted to the Arduino. The data is transmitted by the access node to the internet, where it is immediately accessible. The necessary stakeholders and the manager of the bird farm are informed in real-time when access nodes, as well as the cloud, take an action in response to data from sensor devices. For mobile connectivity, a GSM module is used for sending SMS.

B. Software design

The proposed system is built and put into action based on a few key factors that have a significant impact on birds' health, while also offering the required controls and upkeep. Fig. 2. shows the proposed system's flow diagram. The temperature and humidity sensor, DHT11, provides information. The recorded data is compared to the ideal temperature needed for the bird to survive, and if there is a decrease in temperature or a rise in temperature, the appropriate steps are taken. If the temperature is high, a fan is

engaged until it returns to normal; if it is low, a heater is activated. Likewise, a fan is turned on if the humidity is high and water vapor is blown if it is low. Thus, the farm is able to maintain its ideal temperature and humidity.

The container's water quality is checked using a water

are kept at their ideal levels and the quality of the water is tested and supplied in good condition. The health of the birds was better, and there were fewer losses due to the automatic water and food supply in case of shortage. Automation results in less labor. The loss of birds is prevented with a theft alert

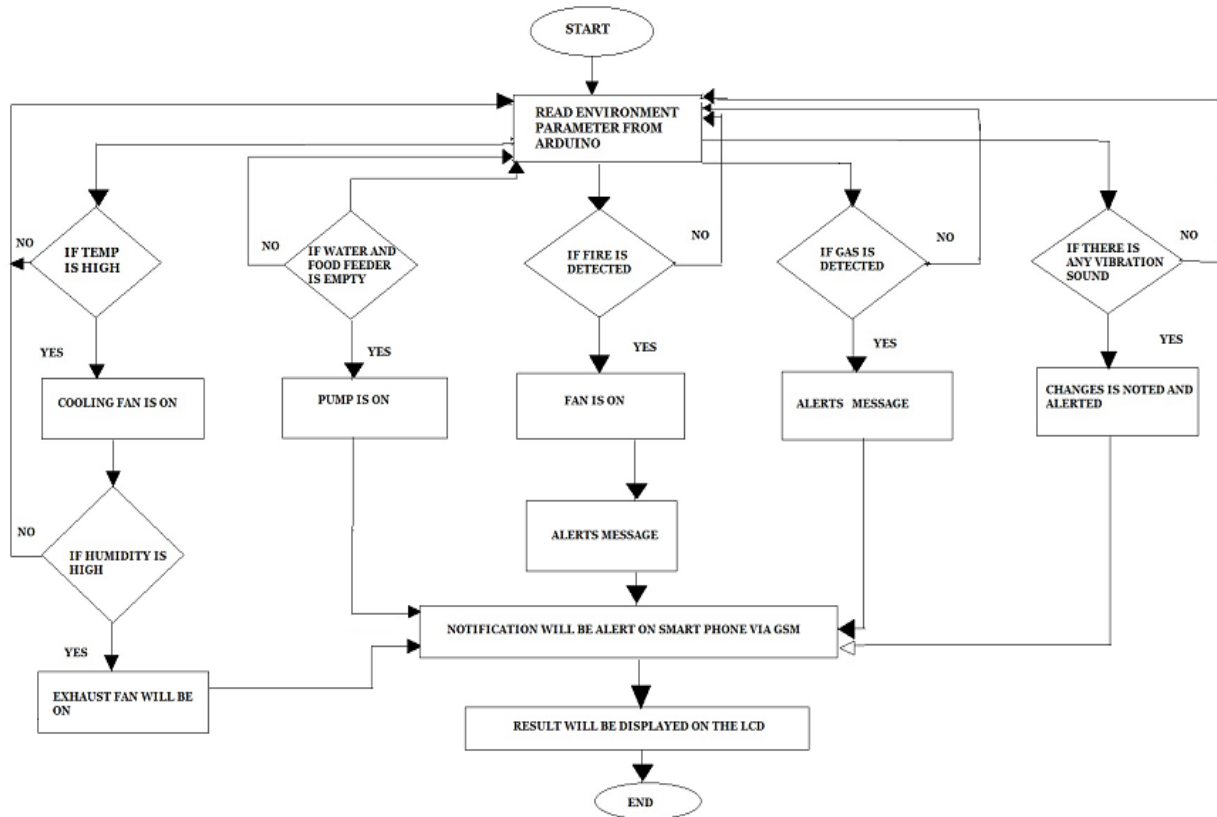


Fig. 2. Proposed approach's flowchart

quality sensor. If the water is unsafe to drink, the owner is informed and instructed to change the water. Therefore, the two major facts mentioned above can be used to treat the health issues affecting birds and to maintain a healthy environment, which will aid in the development of birds.

Additionally, the lighting system is set up to save electricity waste and automate the farm, which reduces labor requirements. If the tank is discovered to be empty, the water and food pump system will assist in filling it with the assistance of a pump. The food and water feeder is checked to see if it is empty using an ultrasonic sensor, if there is insufficient water, a water pump is engaged to fill the container. Likewise, the gas sensor is used to detect any gas released inside the farm and alerted accordingly. The fire sensor helps in detecting the fire and the fan is turned on once the fire is detected and also alerted the employee and owner. The cage's doors have an anti-theft mechanism installed as well. The alarm system is set off if there are any theft-related activities discovered, and the alarm notifies the owner and labor of this. Overall, the farm is fully automated.

V. PERFORMANCE ANALYSIS

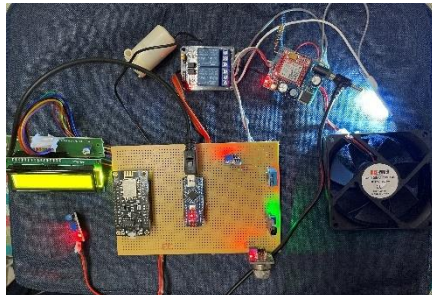
In this paper, we automated the entire bird farm and concentrated on resolving the key issues influencing the health of the birds. Major parameters like temperature and humidity

system. The automated farm decreased the amount of wasted electricity. Continuous observation made it possible to keep track of the health of the birds and give them favorable condition to survive. Through the smartphone or computer, the owner is alerted of all changes and is able to stay updated on them. The suggested system contributed to maintaining a hospitable environment for the survival of the birds.

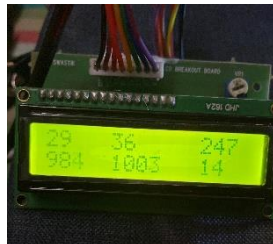
VI. RESULTS AND DISCUSSION

Fig. 3. shows the final prototype and outcome of the suggested system. Every time modifications are discovered, the owner is notified immediately. In the event of a fire, gas leak, or attempted theft, an SMS is delivered to the owner's mobile device. As a result, the owner receives updates regarding the cloud-based real-time monitoring of parameter changes. Temperature, humidity, gas detection, fire detection, LDR, and vibration sense are the values that are displayed on the LCD. The ideal temperature is kept between 40 and 41 degrees Celsius, so if the temperature rises, a cooling fan is activated until the environment reaches the ideal temperature. The humidity level is also maintained at its ideal level. Any smoke or gas produced is detected by the gas sensor. The ideal value is maintained at 400, thus if there is an increase in value above 400, a message alerting that gas has been detected is issued. LDR values will fall between 800 to 1023. It can only

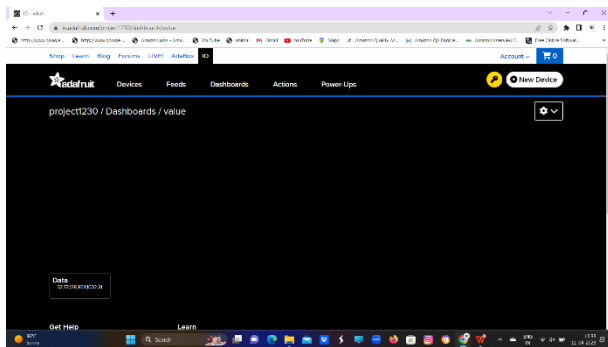
resist those limits, therefore if there is an excessive amount of light, it cannot take it and blinks.



(a)



(b)



(c)

Fig.3. Proposed system's hardware units and results (a) Entire hardware units, (b) LCD, (c)Data's displayed in the cloud interface.

VII. CONCLUSION

Thus, installing a low-cost smart device on the farm may provide numerous benefits to the poor farmer while also improving farm output. It aids in maintaining a safe environment for the survival of the birds. The adequate provision of food and water aids in preventing the spread of infections that could harm the bird. It will also be a factor in preventing disease spread. The proposed system improved bird management and observation. This promotes the health and growth of birds. This will be a solution for the following Sustainable Development Goals: Poverty Eradication, Good Health and Well-Being, Clean Water and Sanitation, Decent Work and Economic Growth, and Climate Action.

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